

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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The "Peerless" Portable Engine.

Messrs. F. F. & A. B. Landis, of Lancaster, Pa., are manufacturing the portable engine illustrated on this page. The makers claim that they have remedied old evils and introduced the best modern practice in the design and construction of its parts. In order to secure this result every detail has been carefully studied and the best materials used. The engraving represents the "Peerless" as mounted and ready for transportation.

One of the greatest claims of the makers lies in the benefit derived from the use of a water passage between the boiler and the bearings of the engine. Through this passage the water circulates while cold, and absorbs the heat that would otherwise be imparted to the bearings, which is sometimes occasion of considerable damage and delay and a great waste of power. The water after leaving these passages reaches the pump and is forced through the heater to the boiler. The heater consists of two pipes, one within the other; the outer is of cast iron and contains a spiral web, which fits against the inner exhaust pipe. This makes a spiral passage through which the water moves and absorbs a great amount of heat before reaching the boiler. The engine itself and its fly wheel are placed on opposite sides of the boiler, and in such relative positions as to balance the machine and at the same time prevent it from being too top heavy for transportation and service. The cylinder and steam chest are combined in one casting, thus making but one joint on the steam chest. One head of the cylinder is cast solid with it, merely leaving the hole for the piston rod and stuffing box, thus making fewer steam joints liable to leakage. Through bolts are used for cylinder head and steam chest cover, the maker claiming them to be superior to studs, which are sometimes twisted off before they can be taken out. The cylinder is bolted at one end to a flange cast to the end of the frame. By this arrangement the cylinder is free to expand, as it rests upon a bracket fastened to the boiler, and slides on it as the boiler expands or contracts, thus avoiding strains from that cause. The bed-plate is fitted up to receive the cylinder at one end and the saddle or bearings for the crank shaft at the other, with palms or webs to carry the guides. These bearings are adjustable from four sides, and the makers claim that by an improved simple arrangement, they are easily managed by even an inexperienced person, and cannot be made too tight. The bearings are large and will run a long time without adjustment, and the support being hollow and filled with cold water, protects them and keeps them cool and in good running order. The crank shaft is made of the best American cold-rolled iron, claimed to be equal in wear to a steel shaft. The crank is a cast-iron balanced plate wheel, carrying a hardened steel crank pin, ground true by special machinery. The cross-head pin is also of hardened steel. The eccentric is placed back of the crank, and arranged so that by loosening a nut on the front of the crank wheel the eccentric can be reversed by an inexperienced hand,

ranged to give entire control of the water supply to the boiler. The water of condensation is also collected from the exhaust and returned to the tank for future use, thus preventing incrustation to that extent. The governor is a late improvement connected directly with a balanced valve, and instantaneous in its action. The throttle valve is arranged to shut off inside of the steam dome, avoiding much of the water of con-

\$1.25 to \$2; harness makers, \$1.50 to \$2.50; glass blowers, \$1.75 to \$3; cabinet makers, \$1.25 to \$2; piano-forte makers, \$1.50 to \$2; laborers, 90c. to \$1.25; brass finishers, \$1.50 to \$2.

Improved Hoist.

The progressive tendency of modern methods of transacting business, the in-

crease of shipping facilities on wharves, the speedy storage of coal and other material in proper receptacles, and the rapid handling and transfer of goods generally, is largely dependent upon the use of efficient hoisting apparatus that will do the work quickly, conveniently and at a moderate expense of both fuel and repairs. We illustrate upon this page one of the latest forms, built by Messrs. Stokes & Parrish, Thirtieth and Chestnut streets, Philadelphia. It combines all the latest improvements, and is readily manipulated by a single lever. It is either portable or semi-portable, as may be desired. The makers lay great stress upon the excellence of the workmanship, which is of a superior order, great care being taken to produce a machine strong, simple and durable. Its construction is indicated in the cut, showing the two drums and gearing operated entirely independent of each other, and thus two vessels lying at a wharf may be loaded and unloaded at the same time, using only a single engine and boiler, which is a great saving in many ways. The engine is of the ordinary vertical type, with a substantial fly wheel on the crank shaft and a double throttle connection (one for each drum). These drums are loose upon the shaft, and are thrown into gear by a friction cone bearing, operated by a wedge which is forced into action by its connection with the shaft of the working lever. The throttle attachment is connected to the wedge just mentioned; at another point of the working shaft the brake is applied. This arrangement places the management of each drum of the machine under the control of a single lever. When the lever is at one end of its throw we have steam shut off, the friction cone out of gear, and the brake applied at the will of the operator, as the load is to be lowered quickly or not; as the lever is thrown toward the other end, the brake is relieved, the friction cone thrown in, and steam admitted up to the maximum, according to the distance the lever is moved. By the double throttle connection the engine never uses more steam than is necessary to do the work, as each valve is merely opened wide enough to admit sufficient steam to drive its own drum.

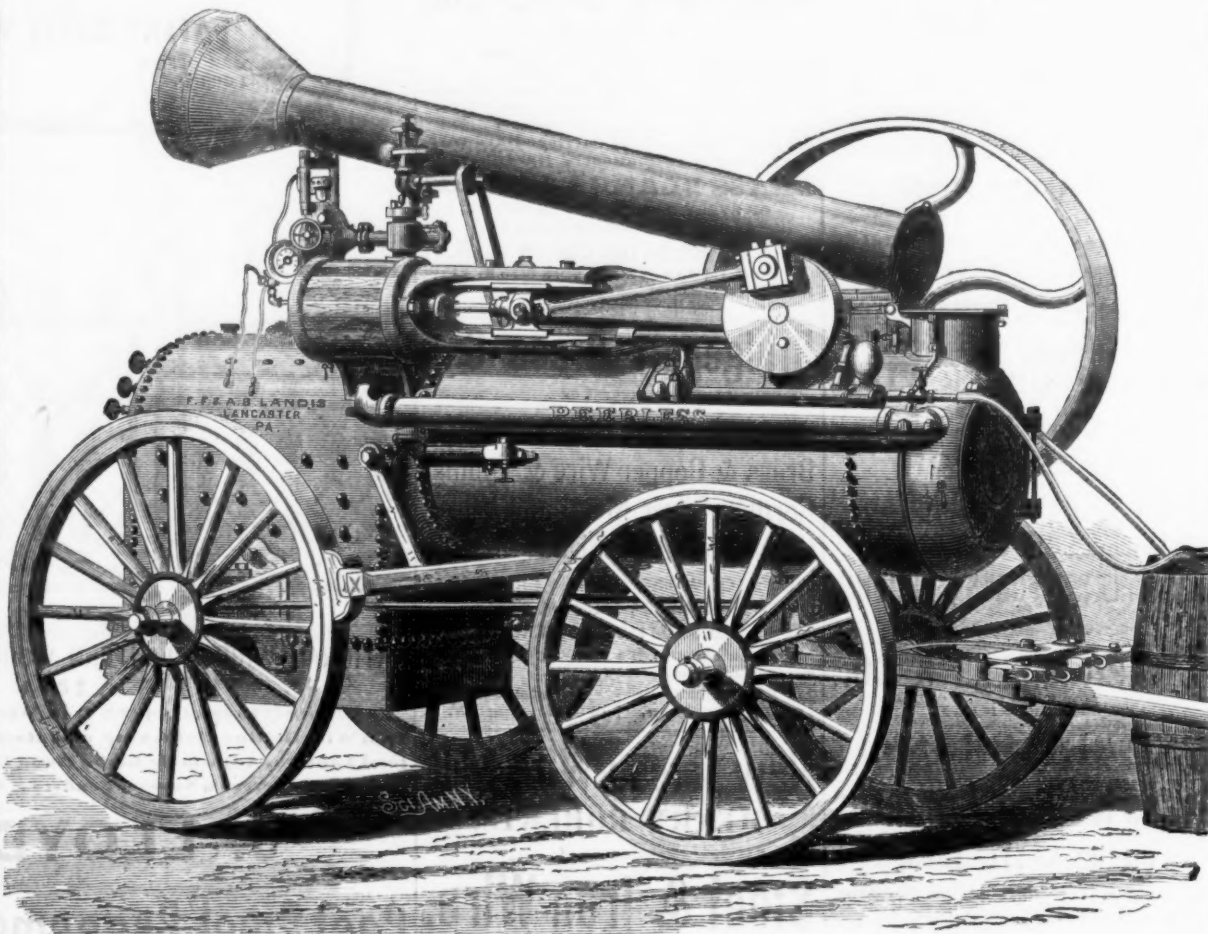
Eclipse Boiler Feed Pump.

Mr. M. Schultz, of 170 Plum street, Cincinnati, Ohio, is manufacturing a boiler feed pump of which we give an illustration. It consists essentially of an inverted vertical "slotted cross-head" engine, which drives a pump-plunger from the lower side of the cross-head. Taken altogether this is one of the simplest forms of rotative pump which has yet been devised. The crank pin is of steel, surrounded by a steel roller which drives the cross-head. The packing is all metallic.

and returning. With a train of cars and passengers, the time between Rector and Fifty-ninth streets was 18 and 20 minutes. When regular trains begin they will each stop at 11 of the 13 stations on the road, no one of them stopping at all. The president speaks explicitly in regard to the stability of the structure and ease of its curves, the latter causing so little motion and so little detention as to be scarcely perceptible. He speaks with enthusiasm of the elevated system in comparison with surface roads, the rails being almost literally immovable, while there is no liability to a disturbance of the alignment from the passage over them of loaded vehicles, as in the case of surface roads; the tracks are never obstructed by snow or ice; they are not affected by frost; and in case of any accident the parallel "guards" would prevent any serious result, as the cars would slide along the rails without harm until the momentum was overcome. The structure beyond a doubt is far superior to the original Gilbert road, and the work has been done with a thoroughness and dispatch highly creditable to the several manufacturers who took the contracts.

Professor Richard Owen, of the Indiana State University, has lately made some important experiments upon the force and direction of the earth's magnetic currents. He finds that the direction of the continuous current is toward the northwest. The strength of the underground currents varies in these experiments with the amount of metallic surface buried (from which wires lead to the galvanometer), the length of wire, the time of day, the state of weather and other circumstances. The magnetic meridian of Bloomington, Indiana, is between 5 and 6 degrees east of north. The strongest currents yet found have been soon after sunrise, and nearly or quite at right angles to that meridian, i. e., from east-southeast to west-northwest. A less powerful current flows at that time from southeast to northwest, but after crossing the magnetic meridian, the current again becomes stronger from the southeast to the northwest. By about 1 or 2 p. m. the currents are so modified as to mark several degrees less of galvanometer deflection for the first two directions mentioned, and several degrees more deflections for the last two directions; as if, in short, the strength followed the apparent course of the sun. Professor Owen suggests that some day there may be a use discovered for the constant supply of force indicated by these earth-currents. He thinks it possible that the continuous current which he finds from the metal plates above the ground to metal plates beneath it, might prove of service in hastening the growth of plants; as, for instance, if forcing-beds for early vegetables were held in metallic pans and connected by wires with a metallic roof.

Mr. J. C. Wightman of Boston has invented a Sheep-shearing Machine which is said to work very well. The cutting is done by a rapidly revolving circular knife, working behind blunt teeth, which are pushed through the wool ahead of the knife, thus

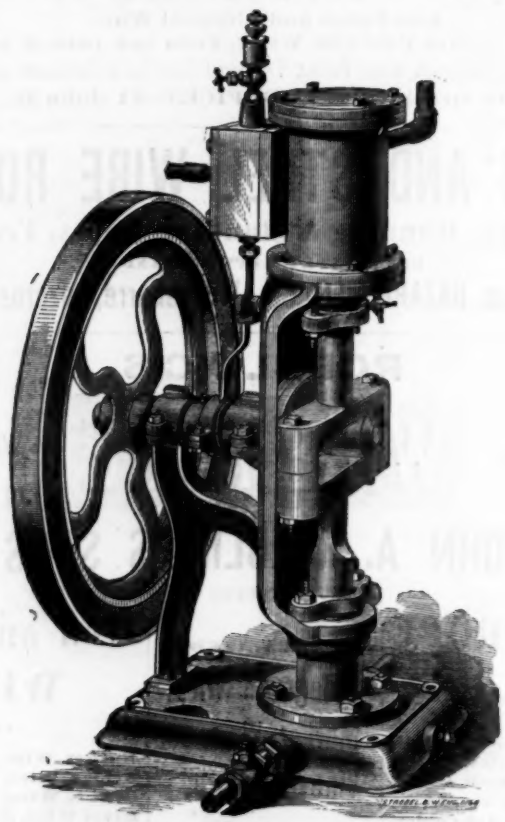


THE "PEERLESS" PORTABLE ENGINE.

densation in the pipes at that point. The boiler is of the best American boiler plate, the locomotive pattern. The fire-box is designed with a water-front instead of a cast-iron front, thus utilizing much valuable heating surface sometimes wasted. A steam blower leading to the stack can be used to raise steam rapidly without running the engine. The makers claim to have secured a portable engine that will successfully fulfill all the requirements of modern labor or manufacture.

The position of the drums affords greater facilities for their simultaneous action than any other, and, as stated before, the arrangements are such that one drum may be hoisting while the other is lowering, without interfering with each other. These hoists are in use by the International Navigation Company at Girard Point, Philadelphia, Warden, Frew & Co., the Atlantic Petroleum Co., the Standard Oil Co., of New York, &c., and orders for them are constantly being duplicated, which is satisfactory testimony as to their utility. A new electric battery has been exhibited before the French Academy. The plates are

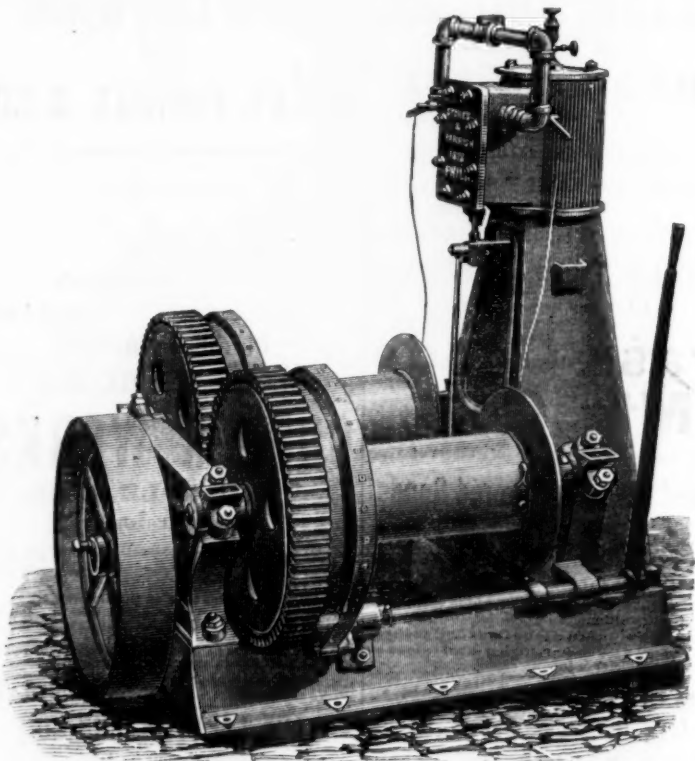
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ECLIPSE BOILER FEED PUMP.

and in a short time. The boxes of the connecting rod are of the best composition of copper and tin, and adjustable. There is a screw and hand wheel over the inlet valve of the pump, which is driven from the cross-head as on locomotives, and by which the flow of water to the pump can be regulated, and always allowing sufficient to prevent heating or drying of the packing. The valves are of brass, and will not rust or corrode, and check valves and pet cocks are arranged to give entire control of the water supply to the boiler. The water of condensation is also collected from the exhaust and returned to the tank for future use, thus preventing incrustation to that extent. The governor is a late improvement connected directly with a balanced valve, and instantaneous in its action. The throttle valve is arranged to shut off inside of the steam dome, avoiding much of the water of con-

Wages in Australia.—The following is said to be the average wages paid per day of 10 hours to mechanics in Australia: Carpenters, \$1.25 to \$2; roofers, \$1.75 to \$2.50; plumbers, \$1.75 to \$2.25; painters, \$1.25 to \$2; machinists, \$1.25 to \$1.75; coopers, \$1.50 to \$2.50; box makers, \$1.50 to \$2.50; ship carpenters, \$1.50 to \$2.50; sawyers, \$1.50 to \$2; engineers, \$1.50 to \$2.50; wagon builders, \$1.75 to \$2.50; blacksmiths, \$2 to \$2.50; boiler makers,



IMPROVED HOIST.

Operating the Gilbert Road.—Mr. Foster, President of the Gilbert Elevated Railroad, was interviewed by our reporter with the object of obtaining from him as nearly as possible the result of various trials had thus far in running cars over the track. The highest speed made was 11 minutes and 4 seconds between Rector street (Trinity Church) and Fifty-ninth street, a distance of just about five miles, or say a mile in two minutes. This speed was made both going

preventing any danger to the sheep. The knife is sharpened by an emery wheel, forming part of the machine, which the operator can apply whenever desirable, without pausing in his shearing operations, by merely pressing a convenient spring attached to the machine. The minutest details of the machine that perfect the results it is hardly necessary to describe here. The motive power is applied to the machine by means of a flexible attachment to the handle.

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THE ANSONIACorrugated Stove Platform.
SEE PAGE 9.**Phelps, Dodge & Co.,**
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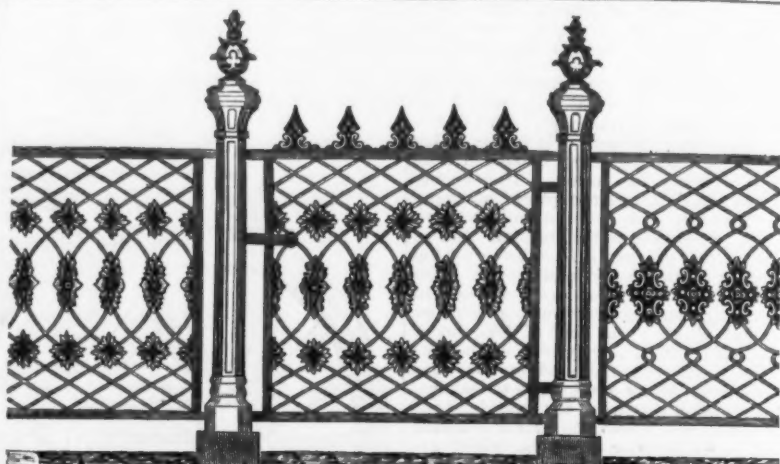
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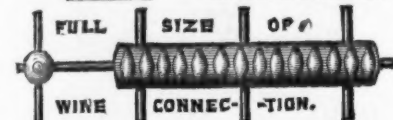
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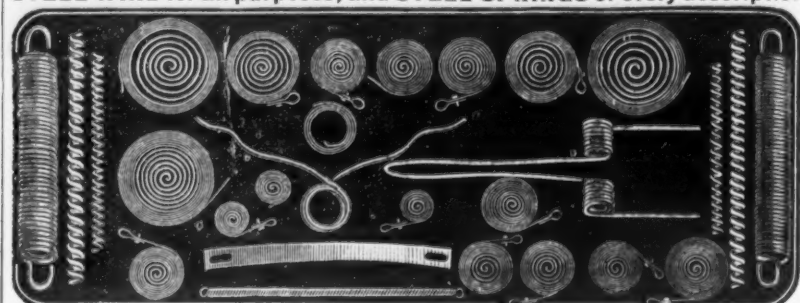
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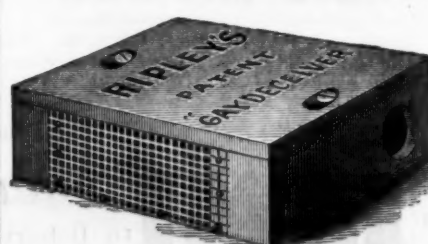
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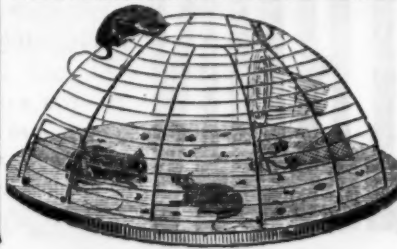
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The sheet iron used for making boiler tubes is either charcoal plate or a superior quality of coke iron. For locomotive boiler tubes only charcoal iron of the very best quality or soft Bessemer steel is employed. Thus, for instance, the Düsseldorf mills use only Swedish Bessemer steel. It is of the utmost importance that the sheet is not cold short, as the finished tubes are subjected to a hydraulic pressure and must be able to undergo the test of being bent double cold. A slight quantity of phosphorus favorably affects welding. The thickness of the sheet is, on the average, 12 to 15 per cent. greater than that of the pipe, as a loss takes place in reheating and the thickness is decreased by drawing in the train. The length of the sheets should be greater by 8 to 12 inches than that of the pipe, and their width exceed the external circumference of the latter by almost half an inch, in order to allow for the lapping of the edges in welding. The piles for the manufacture of the sheet are roughly trimmed. The width of the sheet

drawing bench, the movement of which forces the sheet to pass slowly through the gauge. The tube so formed is smoothed with wooden mallets, and is then taken to the heating furnace to be heated to a welding temperature.

Welding the Tube.—The construction of the heating furnace and its management are the most difficult parts of the manufacture. The tube must be heated uniformly for its whole length to the welding temperature, and it must be withdrawn at once as soon as that temperature has been reached, otherwise the iron is burnt and becomes crystalline and brittle. The hearth is 20 feet long and 1½ feet wide. It is made of quartz, in pieces at least of pea size, and is slightly inclined toward the working door. The arch is 1¼ feet above the hearth near the working door, while near the end it is only 1 foot above it. The working door, which is as small as possible, is at one end; at both sides there are fire-places 3½ feet square, the flames entering the furnace by two flues, ¾ x 1 foot large. Some furnaces are built with two working doors; the tubes in such a case are

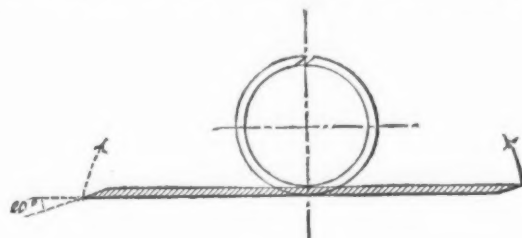


Fig. 1.

cannot be more than 20 to 32 inches. If it were increased, the thickness of the sheet would not be uniform, which in welding would entail serious difficulty. If, on the other hand, the width were too much diminished, the sheet would not come from the rolling mill straight, causing too great an amount of scrap.

It is not advisable to avoid the latter too scrupulously, because frequently the edge of the sheet is irregular. The sheets are not annealed, and it is best, in order to remove scales, to sprinkle them with water during their last passage through the rolling mill. They should be sorted with the greatest care, as flaws grow worse during the manufacture and occasion waste.

Bending the Sheets.—The sheets are cut to correct dimensions by circular saws; their edges should be straight and parallel. Then their long sides are so sloped that the planes of the edge thus formed make an angle of 20 to 25 degrees (see Fig. 1). This is effected by planes, one of which is above and the other below the sheet, which is drawn horizontally on a bench. The drawing bench is composed of an endless chain, supported by two rollers about 20 feet apart. It moves a small carriage which carries a pair of tongs, the lower jaw of which is immovable. The end of the upper jaw is raised by an eccentric lever, one of the arms of which is attached to the endless chain. One of the ends of the sheet is then rolled up, the exterior diameter of the portion turned being a trifle smaller than that of the pipe (see Fig. 2). This operation is performed on a mandrel, which is necessary, however, for pipe of large diameter only. The sheet is next placed in a reheating furnace and brought to cherry redness uniformly for its whole length by a smoking reducing flame. The hearth of these reverberatory furnaces, the type usually chosen, is slightly inclined



Fig. 2.

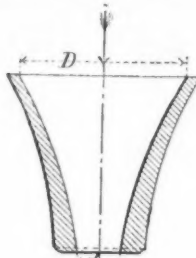


Fig. 3.

toward the working door. The flame, after having passed over the entire length of the hearth, which is generally 20 feet long, enters the main flue either by one large opening in the hearth or by flues in the side walls. The turned end of the sheets is placed near the working door. Before the train for the finishing rolling of the sheets. The most im-

portant part of the train is a cast-iron gauge, the inner surface of which is carefully turned in a gradually widening form. The smaller diameter *d*, Fig. 3, is equal to the exterior diameter of the tube, the larger diameter *D* being 3½ times as large. The larger opening of the gauge is directed toward the working door, its height above the level of the floor being equal to that of the door. As soon as the sheet has reached the required temperature it is withdrawn from the furnace and the turned end is introduced into the gauge. That part which protrudes is seized by the tongs of a

introduced through one door and are withdrawn through the other. Such a furnace will hold from 2 to 4 tubes, according to the width of the hearth; the tubes are so placed that the parts to be welded are acted upon by the flame. The fuel used must have a long flame, be free from sulphur and deposit no soot, because any impurities introduced into the furnace give rise to difficulties. In order to heat the tubes as uniformly as possible for their entire length, three or even four fire-places have been built along one side of the furnace, the flame, after having passed over the hearth of the furnace at right angles to its length, entering a large common flue. This arrangement successfully meets the end desired, but at the same time it considerably increases the expense for fuel. At the Lierendelf Works, near Düsseldorf, the Siemens furnace has been adopted for heating. As near the working door of the furnace as possible is the finishing train which welds the tube. The most important part of this rolling train is composed of two cast-iron disks, *a* and *b*, Fig. 4, 22 to 32 inches in diameter and 6 inches wide, the circumferences of which touch in one point. The drawing gauge formed by their grooves is equal to the exterior diameter of the tubes. The velocity of these disks must be great enough to avoid cooling of the pipe; it varies according to the diameter of the latter, between 60 and 130 revolutions per minute. In England these disks are set in motion by a system of gearing so arranged that the velocity of the train may be varied. As cleanliness is an important point, the disks are provided with scrapers of the form of the grooves. The motor is generally a steam engine of about 30 horse-power, the transmission being effected by means of gearing. The drawing gauge formed by the grooves in the two disks is on the same level as the height of the furnace hearth. As soon as the pipes are heated to a welding temperature, they are seized by double nippers in the hands of two workmen who occupy a position at the sides of the working door, and they are then introduced as rapidly as possible between the two disks. A mandrel of chilled cast iron is placed into the gauge formed by the grooves, its diameter being equal to the inside diameter of the pipe to be welded. The mandrel is pierced by a strong steel bar, *r*, against a collar, *m*, of which it is pressed in rolling. The disks revolve in the direction indicated by the arrows. The end of the bar *r* rests upon a plate which may be adjusted by means of a screw. The pipe is rolled between the mandrel and the grooves of the disks. Generally it is welded in three passes, reheating taking place after every pass. The number of mandrels in stock is very large, as every size of pipe requires a special mandrel, and they are rapidly worn. As soon as the pipe is rolled a workman strikes the end of the bar with a hammer in order to loosen the mandrel, and then the bar may be withdrawn. It is readjusted and a new mandrel is mounted. The work of this man is very laborious, as 300 tubes are made in a day in 900 passes. The rolling requires great care and attention, especially the adjustment of the mandrel.

Polishing and Smoothing the Pipe.—The welded pipes are placed into a reheating furnace and heated to cherry redness, and

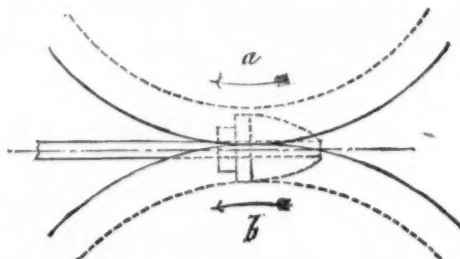


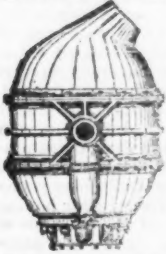
Fig. 4.

passed through a polishing train. The latter is composed of a gauge plate of hardened cast iron, the interior diameter of which is equal to the exterior diameter of the pipe. The edge of this plate removes the scale and polishes the pipe, which is drawn through it slowly by means of a drawing bench similar to that used in bending the sheets. The pipes are smoothed by hammering them, cold, on a mandrel, with wooden mallets. They are then cut into lengths, and are subjected to hydraulic pressure. Pipe which is to be used for locomotive boiler flues must be reheated for a length of 6 to 7 inches,

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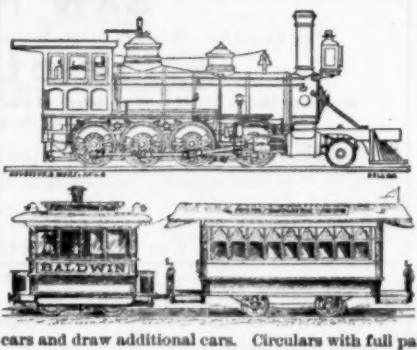
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Railway Supplies, Old Rails and Railway Scrap,
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For determining the per cent. of Pure Iron in an ordinary Ore.....	\$4.00
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and enlarged by means of a mandrel, which, however, does not affect their solidity.

Manufacture of Gas Pipe.—The manufacture of gas pipe varies from the preceding in the following points:

The sheet used is thicker, because the ends of the pipe must be threaded.

As gas pipes need resist a small pressure only, the sheets used may be of inferior quality. They are cut and taken to the reheating furnace. Three methods of drawing pipe may be distinguished. The first is to draw through a gauge plate, a method which has been described above. The second differs from the first because the sheet is first rolled up. This bending is executed at a red heat, either by passing the sheet between a semi-circular gauge plate supported by a frame and a mandrel which presses it by means of a series of levers, or by using an elliptical gauge plate at the end of which is a mandrel attached to an iron rod. The sheet thus bent is heated to a welding temperature and drawn on a drawing bench. The peculiarity of this drawing is that the gauge plate is formed by the ends of tongs which differ from ordinary tongs only by the elongation of the arms to both sides, so that they may be worked by two men at both sides of the train. The edges of the gauge-plate are hardened so that the tubes are polished. A workman takes the pipe from the furnace and takes it to the bench. The tube is first drawn for half its length; then it is reheated and goes to the finishing train. In order to make this practicable it must be possible to open the tongs. The difficulty with two heats is that the iron is easily burned. While they are still hot the pipes are taken to the apparatus for making their diameter and their thickness uniform. This apparatus consists of a stationary iron table, above which a large heavy iron plate is suspended from its corners; it is moved by eccentric, and causes the pipes to roll about while it presses upon them.

The third method combines the peculiarities of both the foregoing—the bending and drawing of the pipe performed at the same time. A pipe already drawn may be without loss of time redrawn for a part of its length. The gauge-plate is formed of two parts, the lower being attached to a frame, while the upper movable part is moved by a system of levers. Both parts must be adjusted as perfectly as possible; if not, the pipe made will be defective. Cutting the pipe into lengths, threading their ends, &c., are performed in the usual manner.—*Revue Universelle.*

The Beginnings of Steam Navigation.

The 4th of April having been the fortieth anniversary of the sailing of the *Sirius*, the Philadelphia *North American* recalls as follows some interesting facts respecting the beginnings of steam navigation:

The record shows that the steamship *Savannah* sailed from Savannah for Russia via England in 1819, and returned to New York; the first sea voyage of a steamship from New York having been that of Mr. Stevens' *Phoenix* to the Delaware in 1808. On the 4th of April, 1838, the steamship *Sirius* left Cork, and on the 8th the *Great Western* left Bristol for New York. They arrived together on the 23d, and the anniversary of the first return occurred as stated. The *Britannia*, which sailed from England July 4, 1840, was the pioneer of the Cunard steamship line, and of all later regular transatlantic steam commerce. The first success was achieved against Dionysius Lardner's demonstration of its scientific impossibility; the later successes have been won against as earnest disproof, and the great preponderance of foreign tonnage has contradicted expectation and hurt American interests. The enormous amount and steady growth of this commerce shows the corresponding growth of our European business and our enlarging entry into the world's trade. The two vessels that less than half a century ago started the maritime interests of the leading part of the nation gave no intimation of the wonderful change their success was to work in our commerce; none of the decadence of domestic tonnage that was to follow, partly owing to our apathy, partly owing to remoter and more trying causes; none of the willing surrender that would be made by New York merchants, or of the determined effort at recovery and gain that, beginning in the Delaware, has already attained so much consistency, and must grow and eventually regain all we have lost with reprisals, unless prevented by suicidal assent to foreign theories.

In little more than the third of a century our commerce has undergone this great change and experienced the loss suggested. The loss is due to a variety of causes. Prominent among them has been that jealousy which opposed the upbuilding of any great branch of trade by incidental legislation lest it should help some more than others; devotion to political legislation at the cost of industrial and commercial, and to constant foreign influence pressing upon Congress to prevent thoroughly American legislation. Every considerable European country has subsidized and subsidizes its steamship lines, for general as well as particular reasons. Our neglect to do so has discriminated much against our own marine, and consequently against the opening of new markets and growth of manufactures, and against the inventive capacity and labor and employment of capital at home. Now, with money on a specie basis, with manufactures pressing for markets, with cheap labor, with great inventive skill, with singular aptitude for commerce, and with the beginnings noticed, we may fill our harbors with our own tonnage, and give a different complexion to the maritime facts that will meet the semi-centennial of our steam commerce.

Johnstown, Pa., has long been known as the seat of the Cambria Iron Works, but it is hereafter to be known as the seat of many and varied industries. There are now in operation a large steam tannery, a large woolen factory, a screw factory and two steam grist mills, and there have just been added a steel wire works and a novelty steel works. At the latter establishment will be manufactured rake teeth, finger bars for moving machines, carriage springs, &c., all of Bessemer steel. The wire to be manufactured at the wire works will also be of

Bessemer steel. In nearly all of the enterprises named the Cambria Iron Company is a leading stockholder. The wire works are owned by D. G. Gautier & Co., Limited, and the novelty steel works by the Gautier Steel Co., Limited. D. G. Gautier and some of his business associates, as well as many of the workmen to be employed in the wire and novelty works, have been residents of Jersey City, N. J., where D. G. Gautier & Co. have since 1870 owned and managed an extensive establishment for the manipulation of steel, known as the Lafayette Steel Works.—*Bulletin of the Iron and Steel Association.*

Captain Ericsson's Torpedo Boat.

The Swedish inventor, Capt. Ericsson, whose experiments with the "hot-air motor" are known the world over, and whose various mechanical achievements have placed him in the front rank of engineers, has in process of construction at the Delamater Iron Works, foot of Thirteenth street, North River, an iron torpedo boat in which a number of inventors, engineers and nautical men manifest a deep interest. At the same time it is difficult to learn much about the thing, whatever it is, since those connected with the establishment will give no information. Visitors are privileged to see what they can. The craft is now almost wholly in frame, every rib being in place, with the stem and stern posts erect. All the frames are of angle iron, accurately bent to the model. The stem and stern posts are solid, both being made with an expanded orifice a short distance below the water line. At the stern are bearings for the propeller shaft, each pair of ribs through several of the series being brought in contact from either side, except as circular openings remain on the shaft line. But the striking feature in the vessel so far as construction has advanced is a similar opening in the stem, from which it is supposed the torpedo apparatus will be worked. The latter is understood to be a submarine missile, which will be projected with great power, sufficient to destroy an adversary at a long distance; and by means of electric batteries the movements of the missile can be controlled at pleasure, after the manner of the Lay system. The boat is not formidable in size, her extreme length being only 115 feet, but she will be very swift. The working power of the torpedo will be compressed air, in this respect differing radically from anything hitherto used in maritime warfare. The craft itself will be deeply submerged, so as to be almost invisible, exposing the least possible surface to the attacks of an enemy. In model the Ericsson torpedo boat resembles the swift river boats, the ends being very sharp. Results will be awaited with unusual interest by scientists, navigators and men of the military profession.

An Experimental Pavement.—An experiment of some interest has been in progress recently at the new stone Pier No. 1, North River, adjoining the Battery, a section of the Abbott pavement, containing about 4000 square yards, having been contracted for by the Dock Department. The pavement, as laid upon the pier, consists of two coats, the one about 3 inches and the other 2 inches thick. When an ordinary street surface is to be paved, however, a roadbed upon which the coatings are to rest is essential to durability. A worn-out stone pavement may answer the purpose, but a packing of from 5 to 8 inches of broken stone is preferred. There was not sufficient sun to admit of an inspection determining whether the Abbott compound will probably soften under summer heat. Consequently the Dock Department, which should have decided, deferred ordering that the water front about the pier be paved with the Abbott concrete until a more favorable day. The surface was very dry and hard, elastic and yet not too yielding, solid, impervious and noiseless. The first experiment with this material was made in Brooklyn in 1870, when Sacket and Degraw streets were paved with it. No repairs were required until 1877. The upper coat is of material described as petroleum wax, or still wax, produced at the high temperature of 900° F., and claimed to be absolutely unaffected by atmospheric temperature. The sub-coat is a combination of coal tar, asphaltum and gravel 3 or 4 inches thick, but resists pressure or concussion far beyond the supposed capacity of concrete.

A New Pulverizing Machine.—A new mortar or pulverizing machine, recently patented in Germany by the Markische Maschinenbau Anstalt, consists of a funnel-shaped vessel which at the under part widens to a hollow spherical shape. In the funnel moves a truncated cone, having a solid ball attached below within the hollow ball. The cone rests on a pivot, and can be pressed against the funnel by means of a lever. The motion of the cone is effected through a vertical shaft driven by means of conical wheels, and having a crank placed horizontally; thus the cone is caused to roll in the funnel. The material to be pulverized is brought in large pieces between the funnel wall and the cone, is here bruised, and sinks in an increasingly fine state into the space between the spherical surfaces where it requires the proper degree of pulverization. The arrangement is simple and compendious, and is said to give good results.

Another Transatlantic Steamship Line Proposed.—A new steamship line from Gloucester, England, to the United States, has been proposed by Mr. W. Edwards, of Cardiff. In a circular Mr. Edwards points out the great increase of trade between the Bristol Channel, Poole and the United States, and says that all that is required to enable Gloucester to avail itself of a very large proportion of the imports to that district is a regular means of transit, and that from its situation Gloucester above all points in the channel ought to have a large trade with the United States. As an experiment, Mr. Edwards proposes that one steamer should be purchased of about 2200 tons burden, costing about £25,000, the cost to be divided into 64 shares, and to show his faith in the undertaking, he and his friends are ready to subscribe for one quarter of the shares.

Iron.

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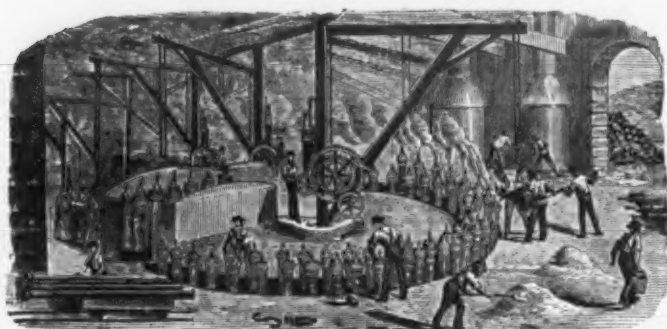
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Infallible Sewer Gas Trap

A SURE AND EFFECTIVE SEAL

Against Sewer Gas.

The annexed cut represents the construction of this Trap, the essential feature of which is the Valve (D), made of pure rubber, treated so as to resist the action of Sewer Gas, &c. The upper end of this valve has a collar around it, which is fastened between the flanges (B) of the case and hangs loosely, suspended from the top, thus securing the easy and rapid passage of waste and water through it, after which the sides of the valve come together and form a perfect and effective seal. The case (A) which contains the valve is made of cast iron, enameled on its inner surface, and is constructed so as to form a rest for the valve and facilitate its instant closing.

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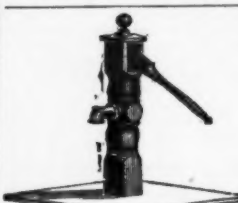
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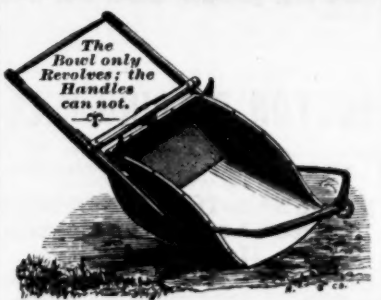
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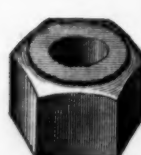
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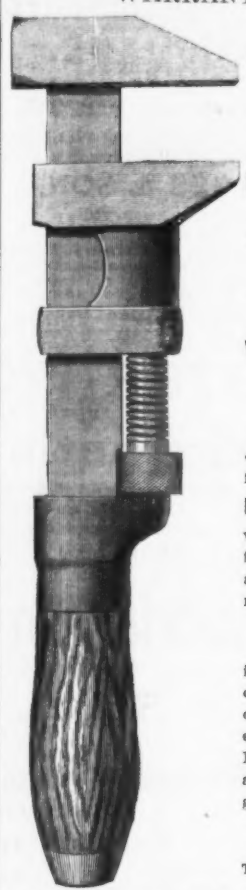
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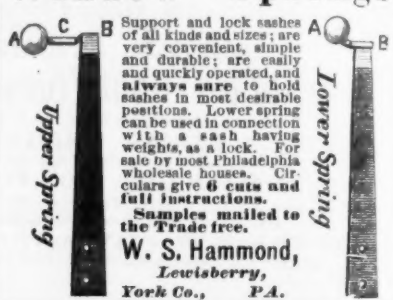
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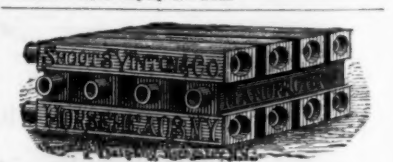
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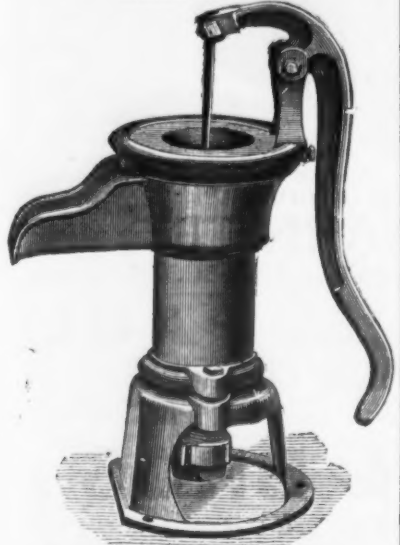
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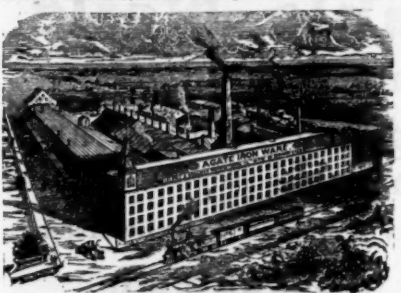
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broad, solid bearings in the knuckle,
which do not wear down readily and
let the door sag. It is Fast Joint,
therefore can be used for either right
or left hand. By actual test it has an
average of 50 per cent. more power
than other Spring Hinges in common
use of same size.

17 Fine Castings a Specialty.
NEW BRITAIN, CONN.

Warehouses,
95 Chambers St., N. Y.
67 Kilby St., Boston, (Pumps.)
Heaton & Denckla, 507 Com-
merce St., Phila. (Butts.)
Send for Illustrated Catalogue
Price List.

Single Action. Double Action.

**THE IMPROVED
HOWE SCALES**

In Competition with the World at Philadelphia, 1876.

TWO FIRST MEDALS, and TWO DIPLOMAS OF MERIT

The following are the points that the Judges officially announce as the basis of their award of the
highest honor to the Howe Scales:

- 1st. For their Protected Bearings (the Howe is the only Scale with Protected Bearings), which makes
the Scale **DURABLY ACCURATE.**
- 2d. For their Strength.
- 3d. For their Simplicity.
- 4th. For their Economy in Construction.
- 5th. For their first-rate Material and Workmanship.
- 6th. For their various original Improvements and Adaptations (which being patented are exclusively
possessed by the **HOWE**).

The Improved Howe Scales

MADE BY THE
BRANDON MFG. COMPANY, of Brandon, Vt.,
Are Guaranteed Superior to all others.

For Plans, Prices and other information, address,

A. M. GILBERT & CO., 95 to 101 Lake St., Chicago; 116 Main St., Cin-
cinnati; 157 Water St., Cleveland, O.; 612 N. Third St., St. Louis.
PRIEST, PAGE & CO., 325 Broadway, New York.
" " " 213 Market St., Philadelphia.
" " " 145 Franklin St., Boston.
" " " 63 Wood St., Pittsburgh.
PARKHURST & CO., San Francisco, Cal.
FROTHINGHAM & WORKMAN, Montreal, Canada.

Weston's Differential

PULLEY BLOCKS,

AND

SAFETY HOISTS.

YALE LOCK MANUFACTURING CO., Stamford, Conn.

Purification of Phosphoric Cast Iron.

To the Secretary of the American Iron and
Steel Association—SIR: A cheap and effectual
method of wholly eliminating phosphorus
from molten cast iron is the important prob-
lem which has exercised iron and steel
manufacturers ever since the great inven-
tion of Mr. Bessemer, supplemented by my
lesser but indispensable process of adding to
Mr. Bessemer's decarbonized molten cast
iron a metallic compound of iron, carbon
and manganese, commonly called spiegel-
eisen, or ferromanganese, has enabled rail-
way companies to lay down steel rails and
engineers to supply themselves with cheap
steel, such steel being now made and sold
at a lower price than the average cost per
ton of wrought iron for these purposes dur-
ing the last 50 years.

From the nature, however, of the Besse-
mer process, which leaves the phosphorus in
the cast iron practically intact, only such
pig irons as are nearly free from phosphorus
have been available for this process of steel
manufacture. By far the largest class of
British pig iron is wholly excluded from
being thus utilized, owing to the notable
quantity of phosphorus with which it is con-
taminated. The Cleveland pig iron, the
cheapest in the kingdom, has been thus ex-
cluded. Mr. I. Lowthian Bell has laboriously
investigated the properties of Cleveland pig,
and has shown that the well-known action
of cinder in washing phosphorus out of
phosphoric pig iron can be applied successfully
at a certain cost to the preparing of that pig
iron, without much loss of carbon, so as to
adapt it for the Bessemer process. Unfor-
tunately, however, the extreme competition
in steel manufacture renders a process
which entails extra expense inadmissible.
Mr. Bell, therefore, cannot, I think, hope to
see his process adopted; at all events, not
with steel rails selling at £6. 10/ per ton.

It has been reserved for Mr. Geo. I. Snelus,
of Workington, to solve this great metallur-
gical problem successfully. Lime has played
a most important part in iron metallurgy,
hitherto, as an indispensable ingredient in
the burden of the blast furnace. Lime will
now, thanks to Mr. Snelus, be found indis-
pensable to the practical and economic suc-
cess of the Bessemer process when applied
to phosphoric pig or cast iron. But the in-
vention of Mr. Snelus will, in my opinion,
effect even more than this. It points, in-
deed, to the manufacture of soft steel, pos-
sessing all the peculiar excellences of
wrought iron without any of its defects,
and the puddling furnace may thus, with
all its manifold imperfections, become a
thing of the past. Seriously I believe that
this invention of Mr. Snelus will cause Mr.
Bessemer, Dr. Siemens and myself to hide
our diminished heads, though, by the way,
mine has been already pretty well hid and
diminished, owing to the golden shower,
which in the world means fame, not having
extended my way.

It would be difficult to overestimate the
value and importance of Mr. Snelus's inven-
tion, assuming, of course, that the requisite
mechanical details can be practically and
economically carried out; and I myself see
no reason for doubting this. I congratulate
Mr. Snelus heartily. Combining a practical
knowledge of chemistry with an equally
practical knowledge of iron and steel met-
allurgy, he is the right man in the right place.
Very truly yours, R. F. MUSHET.
CHELTENHAM, ENGLAND, April 15, 1878.

The Railroad Problem.

Charles Francis Adams, jr., well known
as an able writer upon railway topics, dis-
cusses the questions of railroad combinations
and competitions as follows:

It is discouraging to see how little real
progress this railroad debate makes; how
slow the popular mind is in realizing the very
apparent character of the two horns of the
dilemma which begin to present themselves
through it. For myself I see no escape
from them, and yet there is not a single
paper which I read where the fact that any
dilemma at all exists seems to be recognized.
For the railroad interests of this country it
appears to me to be now a very simple ques-
tion between a quite general and equally
permanent bankruptcy or a legalized combi-
nation. I do not see how the present con-
dition of affairs can last. Our railroads, it
is to be remembered, are not like those of
England or France. In those countries the
great corporations have appropriated dis-
tricts to themselves in which they work as
recognized monopolies, held in restraint by
force of law and the pressure of public
opinion—chiefly the last. Our great corpo-
rations not only hold no such position, but,
instead of working toward it, they are per-
ceptibly diverging from it. They resemble
nothing so much as a mass of eels in a tub.
Twining in and out among each other, they
all reach Boston, New York, Philadelphia
and Baltimore in the East, and Chicago, St.
Louis and Cincinnati at the West. Thus the
competition is the whole time becoming more
pervading and less controllable; and, in the
train of this unrestricted competition, neces-
sarily follows every conceivable form of
railroad discrimination. A city finds its
business leaving it and going elsewhere.
New York, even, is complaining bitterly of
this to-day. The corporation simply replies
that it is but charging the regular and very
reasonable rates; the difficulty is that other
corporations are doing business to other
points at a ruinous loss. They are bank-
rupts—those other corporations—or rushing
into bankruptcy. Are they to drag the
whole system after them? Undoubtedly
they will, unless some one is discriminated
against. There is an unpleasant logic in
this reply.

Such is the alternative. On the one side,
competition; on the other, combination.
Uncontrollable competition leads directly and
inevitably to unbearable injustice in the way
of discrimination; to what New York is
now crying out against. Voluntary com-
bination is so difficult as to be practically
out of the question, except on so small a
comparative scale as to result in discrimina-
tion a little larger and a little more odious.
This also is now exemplified in the case of
New York; just two years ago it was exem-
plified in the case of Chicago.

The difficulty seems to be that all the par-

ties to the situation are thoroughly illogical.
The public calmly asks for an impossibility,
and expects, apparently, some day to get it.
It wants a continual railroad war and cutting
of rates; and yet rates must be equable,
and no one must be charged more than any
one else. The thing is out of the question.
The railroads, on the other hand, try to com-
bine, and yet will not surrender one iota of
independence. They do not want to com-
pete, but they will submit to no external
restraint.

Does any one who observes and thinks
suppose that this sort of a thing can be per-
manent? that such an utterly illogical pos-
ture of affairs can be of long continuance?
If they do, I fancy that the logic of events
will soon or late disabuse them of the idea
through a most disagreeable process of its
own. Bankruptcy will not help the matter,
however. If all the trunk lines were to
collapse into one great financial ruin to-mor-
row, the competition would only go on fiercer
than ever the day after; and the consequent
discriminations would be greater, and the
injustice of unequal rates harder to be borne.
The remedy must clearly be sought in another
direction. If in this country we are to en-
joy the incalculable advantage of steady,
equable, moderate rates for land carriage—
rates which can be calculated on in advance
as a fixed element in every business transac-
tion—if we are to have these, the first step
toward getting them will be found in the
abandonment of the public of this implicit
reliance on an uncontrolled and uncontroll-
able railroad competition. At the same time
that the public abandons this the corpora-
tions must bring themselves to surrender
their darling but costly independence, and
submit to the restraint of the law. I do not
see any other outlet, but both parties have
got to learn a great deal before they ac-
cept it.

**Hardware Manufacturers in Rhenish
Prussia.**

A correspondent of an English journal
writing from Remscheid says of the hard-
ware industry of Rhenish Prussia:

Work is mostly done by little masters,
working themselves and employing four or
five hands. Work is specialized as much as
possible, one workshop confining itself to
shears, another to large shears, another to
small saws, and so on, each of these special-
ties, as in manufacturing towns in England,
having its own particular center, and gather-
ing round it its own collection of subsidiary
industries. The case was formerly the
same at Paris; nearly all the goldsmiths used
to be grouped on the quay that still bears
the name of "Goldsmith's Quay," and they
are still numerous there. So at Lisbon there
are a Gold street and Silver street close to-
gether, each of which used to be the head-
quarters of the gold and silver trades re-
spectively. The goods made at Remscheid
are not exported directly by the little masters.
The makers of a single article of hardware—
say frying-pan handles—cannot offer his
naked specialty in all the four quarters of
the globe. Commission houses have there-
fore sprung up, which centralize the various
classes of goods manufactured and hawk
them all over Germany, and in foreign coun-
tries by the agency of travelers. The sys-
tem of division of labor is kept up in the
commercial department. One house does
with England, another with France, another
with Spain, and so on. A few of the masters,
whose operations are on a larger scale than
that of the average, deal directly with
wholesale consumers, railway companies,
&c.; but this is exceptional, as is also the
manufacture of certain special articles by
exporting houses. The effect of this dis-
tribution and division of labor is that the
work is done in the shortest possible time
at the lowest possible rates. We have seen
complaints made in various newspapers by
English dealers to the effect that German
goods are offered at lower prices in England
than they can be made at there. A good
many of the articles exported by England
are made in Germany; of this, since our
visit to Remscheid, we have no doubt what-
ever. We are aware that similar conditions
of production exist elsewhere, as, say, in
the Jura, in the manufacture and sale of
watches; but it seemed worth while to point
out this fresh illustration of the moral and
physical advantages of this almost patriar-
chal system over the factory system, which
herds hundreds of human beings in immense
work prisons, cut off from their homes and
their families. We shared till now the com-
mon belief that this little-master system pre-
cluded the employment of the costly machine
tools contrived in aid of modern manufac-
tures. The belief is a mistaken one; we
were shown hydraulic motors and steam en-
gines in shops where a master and four
men were employed exclusively in polishing
saws or forging the same monotonous pieces
of steel.

Tempering Files.—After the files are
cut the necessary hardness must be given
them. For this purpose the following com-
position is used: 2 parts (by weight) of salt,
15 parts of rye grit and 30 parts of burnt
cow hoofs, all ground together and mixed
with a sufficient quantity of water to make
a pasty mass, with which the files are cov-
ered. When dry they are placed in a fire.
If during the heating the coating should
drop off at certain places the files are
promptly withdrawn and the place exposed
is covered with dry hoof powder. It is re-
turned to the fire, where it is left until a
temperature is reached which best suits the
steel of which it is made. Then the file is
plunged vertically into the bath specially
prepared for the purpose, care being taken
not to move them to the right or left, as that
would cause warping and make them unsal-
able. The bath is made in the following
manner: 28 parts of salt are dissolved in
about 5 parts of water, to which a handful
of iron scale is added. After tempering the
files are washed, brushed and dipped into
lime-water to prevent rusting. As soon as
they are entirely dry the tangs are softened
by being plunged into red-hot lead. When-
ever it is only necessary to give the files a
black color, it will suffice to dip them hot
into ordinary oil. Before packing them it is
well to paint them with turpentine mixed
with white lead and lampblack.



USE THE BEST.

NEW



THE NEW AMERICAN FILE COMPANY have the exclusive right to use the Bernot process for cutting Files. By this method all the advantages of hand cutting are secured, together with an accuracy unattainable in hand work. They are the only manufacturers who employ machinery for testing Files and Steel.

NEW AMERICAN FILE CO., Pawtucket, R. I.

AUBURN FILE WORKS,
Superior Hand-Cut
FILES AND RASPS,
MADE FROM IMPORTED STEEL. EVERY FILE WARRANTED.
FULLER BROS., Sole Agents,
89 Chambers and 71 Reade Streets, N. Y.

Granted for
After more than Fifteen Years of Competition
McCaffrey's Philadelphia Hand Cut Files and Rasps
Have Proved their Great Superiority.



Silver Medal.
Messrs. **ARNOLD & CO.,**
310 California St., San Francisco,
Sole Agents for Pacific Coast.

Steam and Frost prevented on Show Windows.



REVOLVING VENTILATORS

For everything (and every size), from a hat or cap to an exhibition building. Kitchens, Laundries, &c., ventilated without draft. Durable, strong, without rivets or solder. Oiled for six months. Each one has storm cap. Retail price, size six inch diameter, \$1.00 and upwards; apparatus with which any one can cut circles in glass, 15 cents each.

Protective Ventilators avoid drafts, exclude dust, dampness, malaria and germs of disease; adopted by hospitals, schools, institutions, &c., applied to any window or room.
Prof. A. L. LOOMIS, M. D., University of City of New York, writes as follows:
"From my personal experience and that of my patients who have used your Ventilator during the past six months, I am convinced that your method of removing dust, impurities and dampness from the atmosphere is the best which has as yet been proposed. By it the air in an apartment can be constantly changed without causing drafts. I would especially recommend its adoption in sick rooms, sleeping apartments, nurseries and school rooms."

Air Filters and Moisteners, placed over hot-air registers of furnaces, &c., prevent dust and supply steam filtered air. Prices and discounts to the trade sent on application.

The "Economy" Molding Weather Strip is perfect in every respect. By enlarging edge of rubber or felt, and making slot in molding to correspond (see engraving), we save all after expense of molding. Once purchased it will last a lifetime, because rubber, etc., has only to be removed by taking old piece out of either end of molding, and sliding in a new piece. By this method of securing rubber all uncertainty of fastening or undoing of glue or tacks is overcome.
Rubber supplied with enlarged edge and instructions to enable Car Manufacturers, Carpenters, Builders and far off trade to make slots in Sashes, Doors, Moldings, &c., and thus make perfect Weather Strips.

No. 6.

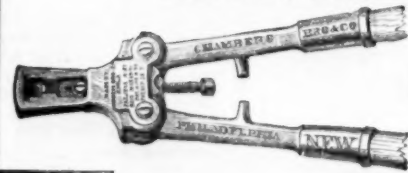


BRACHER VENTILATOR CO., No. 3 Park Row, New York.

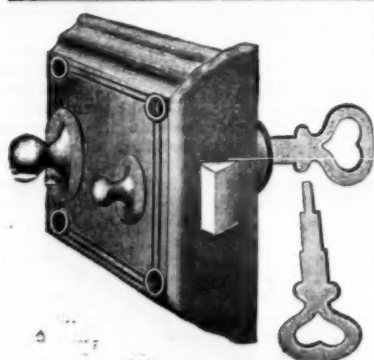
Bolt and Rivet Clippers,

For cutting off the ends of bolts and rivets, on carriages, wagons, harness, &c.

SEND FOR A CIRCULAR AND PRICE LIST.



Liberal discount to the trade.
Chambers, Bro. & Co.,
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Extension Cylinder Night Latches.
KING'S PATENT, June 26, 1877.

Cylinders adjustable for doors from 1 1/4 inch to 2 inches.

FRANCIS MANY,
143 Chambers St., New York.

FILES & RASPS,

Best Cast Steel.
HAND-CUT. Manufactured by
JOHNSON & BRO.
No. 1 Commercial Street, Newark, N. J.

ESTABLISHED 1860.
Chas. Spruce & Co.,
Manufacturers of HAND CUT
FILES AND RASPS.
Every File warranted.
CHALMERS & MURRAY,
Sole Agents, 76 Reade St., New York.

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94 Chambers St., N. Y., Agents for
American Screw Co.'s Wood, Machine and
Rail Screws, Stove and Tire Bolts, Rivets, &c.
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A. Field & Son, Tacks, Brads, Nails, &c.
G. F. Warner & Co., Carriage Clamps.
We have also on hand a general assortment of Hardware.

BORAX.

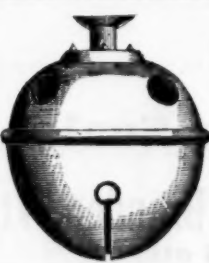
Concentrated Borax in sacks.
Selected concentrated Borax in barrels.
Refined Borax in cases.
Pulverized Borax in barrels.
Pulverized Borax in pound and half pound packages.
Being Sole Agents for Messrs. Smith Bros., OWNERS OF THE MINE, we are enabled to sell at the lowest prices.
WM. T. COLEMAN & CO.,
NEW YORK, 180 Pearl Street.
SAN FRANCISCO, CAL., Cor. California and Front Sts.



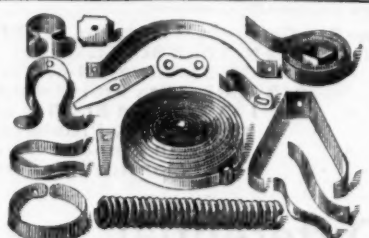
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Manufactured by
THE SMITH & EGGE MFG. CO.
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"Superior in Every Respect."
This is one of the best selling Locks in the market, and affords the dealer a large profit. It is thoroughly and strongly made—of the best material—very handsome in appearance, and every Lock is warranted.
Orders solicited. Address as above.
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Bevin Bros. Mfg. Co.,
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Manufacturers of
SLEIGH BELLS.
House, Tea, Hand,
Gong Bell &c.
Bell Metal Kettles.

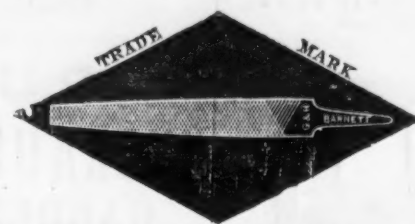


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Manufacturers of
Clock Springs and Small Springs
of every description, from best Cast Steel,
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PERRY & CO.'S STEEL PENS.

A Sample Card containing our leading styles mailed on receipt of 25 cents.
PERRY & CO., L'd, London,
119 & 114 William St., New York.

Black Diamond File Works.



Awarded by Jurors of Centennial Exposition, 1876, for
"VERY SUPERIOR GOODS."

G. & H. BARNETT,
39, 41 & 43 Richmond St., Philadelphia.

CHARLES B. PAUL,
Manufacturer of HAND CUT FILES.

Warranted CAST STEEL. 187 Tenth Street, Williamsburgh, New York.
All descriptions of Files made to order. Price List mailed on application. Established 1863.

HELLER & BROS.,
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Manufacturers of Celebrated

American Horse Rasps & Files.

ALL CUT BY HAND.

And made of the best American Steel, which have been pronounced unequalled in the market by all experts who have been using them for the last fourteen years, and which are now almost exclusively used in all the principal cities of the United States.
For Sale by Iron and Hardware Dealers generally.

AUSABLE HORSE NAILS
POLISHED OR BLUED.
HAMMERED AND FINISHED



The Ausable Nails

Are Hammered Hot,

And the Finishing and Pointing are
Done Cold,

Thus Imitating the Process of Making Nails by Hand.

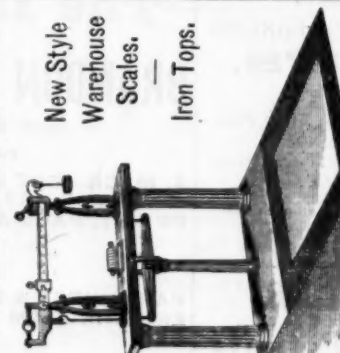
Quality is **Fully Guaranteed.**

For Sale by all Leading Iron and Hardware Houses.

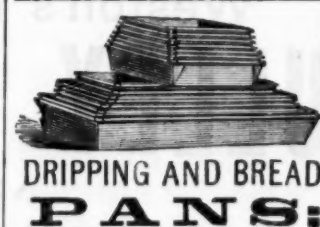
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STANDARD
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New Style
Warehouse
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DRIPPING AND BREAD PANS;

Also Bar, Sheet and Tank Iron and Nails.

LEWIS, DALZELL & CO.,
Pittsburgh, Pa.

Budke's Patent Sheet Iron MEASURES.

Black and galvanized
House, Steamboat, Stable and Well
BUCKETS.
Powder Kegs, Paint, Putty and White Lead PAILS.



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TAUNTON, MASS.,

MANUFACTURERS OF

Copper and Iron Tacks, Tinned Tacks, SUPERIOR SWEDES IRON TACKS

For Upholsterers' Use, Saddlers' Supply Card, Clothing, etc., etc.

American and Swedes Iron Shoe Nails.

Zinc and Steel Shoe Nails, Carpet, Brush and Gimp Tacks, Common and Patent Brads, Finishing Nails, Annealed Trunk and Clout Nails, Hob and Hungarian Nails, Copper and Iron Boat Nails,

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Channel, Cigar Box and Chair Nails, Leathered Carpet Tacks, Glaziers' Points, etc.

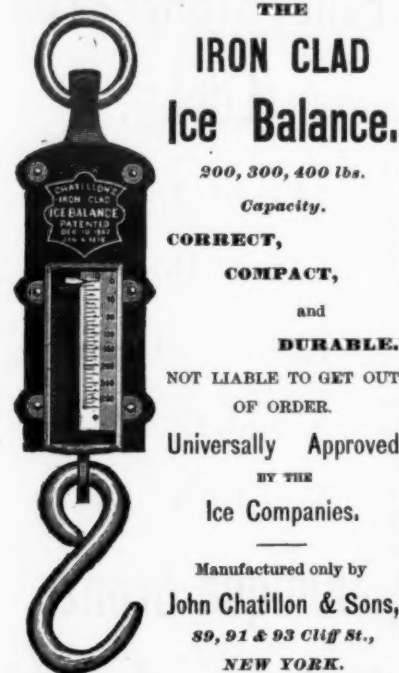
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Any variations from the regular size or shape of the above-named goods made from sample to order.

Hoisting Machinery
MANUFACTURED BY
CRANE BROTHERS MFG. CO.,
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**IRON CLAD
Ice Balance.**
200, 300, 400 lbs.
Capacity.
CORRECT,
COMPACT,
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DURABLE.
NOT LIABLE TO GET OUT
OF ORDER.
Universally Approved
BY THE
Ice Companies.

Manufactured only by
John Chatillon & Sons,
89, 91 & 93 Cliff St.,
NEW YORK.

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351 & 353 Classon Ave., Brooklyn, N. Y.
Manufacturers of

MEASURING TAPES.
Of Cotton Linen and Steel.

For all purposes for which Tape Measures are required.
Only manufacturers of
Paine's Patent U. S. Standard Steel
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Pat. Spring Measuring Tapes
of Linen and Steel.
FINE TEMPERED STEEL SPRINGS,
FINE TEMPERED STEEL BAND SAWS,
From 1/4 inch wide upward. Warranted tougher than
any other Band Saw. Catalogue on application.

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London, 1862; Oporto, 1865; Dublin, 1865; Paris,
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Award and Medal for Self-Coiling Steel
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ORIGINAL INVENTORS AND SOLE

PATENTERS OF

Noiseless Self-Coiling Revolving
STEEL SHUTTERS,

FIRE AND BURGLAR PROOF.

Also Improved

Rolling Wood Shutters

Of various kinds. Clark's Shutters are the Best
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Tribune Building, Lenox Library, Delaware and Hud-
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every principal city throughout Europe, and are in-
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ANSONIA CORRUGATED STOVE PLATFORM

Manufactured by the

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Office, 19 & 21 Cliff Street,
NEW YORK.



Section Showing Round Platform.

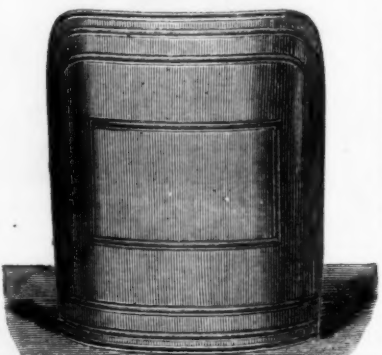
Section Showing Edge.

**ANSONIA
Bronzed Fire Screen,**

With Ornamented Mouldings.

PATENT APPLIED FOR.

The Portable Bronzed Fire Screen or
Shield, as shown in the illustration, is especially
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Being constructed of metal, with firm and substan-
tial edges, curved in form to stand alone, it may be
easily adjusted to any position about a stove, before
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useful, durable and ornamental as a Fire Screen has
long been felt, and having finally accomplished the
desired result, we are prepared to fill all orders
promptly.



CHAINS UNION CHAIN WORKS,
REITER & MORTON,
Pittsburgh, Pa.,
Manufacture all kinds of

Coil, Cable, Crane, Railroad, Wagon and Agricultural Chains,
From Best Standard Brands of Iron.]

Our Chains are all thoroughly tested and warranted, and will be found equal to the
best of either home or foreign make.

Prices the very Lowest.

PHILIP S. BIGLIN.
Successor to W. F. SHATTUCK & CO.,
Manufacturers' Agent for

AMERICAN HARDWARE,
100 Chambers St., New York.

Shattuck's Union and Counter Scales.
Phelan's Axes, Hatchets, Picks, &c.
Wellman's Gimlet, Gimlet Bits, &c.
Griswold's Axes, Auger Bits, &c.
Halstead & Co.'s Stocks and Dies.
Yaw's "Genuine" Wrought Cow Bells.
Baron's Hand and Sleigh Bells.
Malby's Britannia and Cocoa Dippers.
Eddy's Refined Lamp Black.
"Eagle" Axe, Pick and other Handles.
"Eureka" Flint, Sand and Emery Papers.
Cortland Forged Horse Nails.
Tackle Blocks, Spokes, &c., &c.

DARLING, BROWNS & HARPE

Providence, Rhode Island,

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United States Standard Rules,

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Calipers, Caliper Squares and Rules, Plumb Bobs,

Paper Drawing Scales, Willis' Odontographs, Steel Straight Edges,
and T Square Blades.

MEDALS AWARDED: Paris Exposition, 1867; Vienna Exposition, 1873; Philadelphia, 1876.

Illustrated Catalogue sent per mail on application.

New England and the Tariff.

The versatile Gail Hamilton, in a criticism
of the attack made by the Rev. James Free-
man Clarke of Boston on the tariff, and es-
pecially on the protection extended to the
iron industries of Pennsylvania, says with
much pungency and force:

Impelled with what evil angel does Dr.
Clarke select pig iron as the particular ob-
ject of his anathemas when treating of the
worst features of a war tariff? He justly
describes iron as the material of almost all
other mechanical industry, and does not
seem to see that if there be anything at all
in the doctrine of a protective tariff it should
find its strongest support, its most complete
justification, in the independent production
within our own borders of that metal whose
universal use he so forcibly, yet fruitlessly,
affirms. If he has any definite meaning in
arraigning the war tariff for its effects on
pig iron, he means that the American peo-
ple have been forced to pay higher prices for
this necessary metal by reason of the duty
levied. Mr. Clarke evidently derives his in-
formation from the Funny Paragraph col-
umn of his Boston paper. Evidently his
political studies have lain in the stray items
of gossip, the irresponsible and ignorant
chatter that never rises in a tariff discussion
above the wit and the point of calling an
eminent protectionist in Congress "Pig iron
Kelley," and then sinks exhausted beneath
the weight of this crushing argument for
low duties and free trade. I venture to say
that there is not a man in this country, out-
side of a pulpit—there is surely not a man
inside of our National or State legislatures
who would have been rash enough to rise of-
ficially and publicly, and denounce the tar-
riff, with pig iron for illustration, until he
had previously gone to the authoritative of-
ficial sources of information to see what had
actually been the effect of the war tariff.

If Mr. Freeman Clarke would but
descend an instant to the gruesome earth and
examine an official table giving the price of
No. 1 pig iron in the Philadelphia market
for every year of the century, and for every
month of every year from 1842 to 1878—not
half so sonorous a service as standing in a
Boston synagogue and denouncing Pennsylv-
ania sins, yet not without certain mean,
mousing advantages—he would find that
never since the American Union was formed,
under high tariff, low tariff, protective tariff,
compromise tariff or free trade tariff; under
tariff fashioned by Henry Clay or formulated
by Robert J. Walker, was pig iron so cheap
to the American consumer as it is in this
very year of grace under this very war
tariff which he has taken occasion to single
out for denunciation from the sacred desk.
Rise in that desk to-morrow morning, then,
Rev. James Freeman Clarke, in ashes and
sackcloth, and say to your people that you
have sinned a great sin, and that pig iron is
selling in the Philadelphia market at \$18 a
ton for first quality, and as low as \$15 a ton
for the inferior grades. It is a sad hindrance
to the correct conduct of life that when Sir
Oracle opens his mouth in the pulpit no dog
in the pews can bark without throwing or-
ganized society into confusion. It is a stum-
bling block in the way of national progress
that the clergy have been permitted to take
out a perpetual charter of immunity from
contradiction, and may preach any amount
of sacred or secular untruth from the pulpit
without the smallest risk of being taken to
task for it.

The first impression regarding
a man who should speak out in meeting
would be that he was a lunatic, and it is gen-
erally the true one! A clergyman's evil
utterances have consequently full course to
run and be glorified. Had Mr. Clarke
"spoken his piece" in any board of trade,
or any legislative assembly, or any tariff
caucus, he would have been instantly brought
to book, challenged, ridiculed, riddled, dis-
graced. But behind the barricade of the
pulpit he can forge and fulminate his pig-
iron thunderbolts, and not run the risk of so
much as a powder-fizzle by way of reprisals.

Does Mr. Clarke, speaking from a Boston
pulpit, mean to convey the idea that Massa-
chusetts has been injured by this war tariff,
and injured by the votes from "Pennsylv-
ania and elsewhere" forcing this tariff
upon her? If Mr. Clarke were instructed
and intelligent on this subject, as a man
should be who assumes authority upon it, as
a minister should doubly and trebly be who
goes out of his way to rebuke and rectify
those whose study and business and profes-
sion it is, he would know that for 50 years
there has not been a tariff levied for the
protection and development of the iron in-
terests in "Pennsylvania and elsewhere"
that did not receive the vote of every Sena-
tor and Representative from Massachusetts.
Daniel Webster, Rufus Choate, Honest John
Davis, John Quincy Adams, Mr. Winthrop,
Charles Sumner, Henry Wilson, Mr. Hoar,
Sr., and both his able and accomplished, if
somewhat crochety sons, Mr. Boutwell, Mr.
Dawes, Mr. Hooper, Gov. Rice, and the en-
tire long list, have voted steadily, strongly
and uniformly for a protective tariff, includ-
ing the war tariff when it came; and some-
times for tariffs much higher indeed in the
rate of duty than this war tariff which the
courageous Mr. Clarke attacks with his
sword of the spirit. Granting that these
men, one and all, are arrant cowards, what
had they to fear from Pennsylvania? What
harm can the iron masters do to Senator
Dawes or Gov. Rice, that they should not
dare to say their souls are their own?

"What have they to gain by a moment's sin,
To weigh in the scale with their innocent years?"

I should think that the whir of the mill-
wheels of Pittsfield under his windows would
be louder than the roaring of all the forges
of Pennsylvania in the ears of Senator
Dawes.

If Mr. Clarke had been willing to patronize
the Bible by taking a text from it instead of
the newspapers, he might have learned to
correct the optical illusion arising from the
respective localities of notes and beams. It
is amazing, it gives us a new revelation of
clerical possibilities, to see how the great
beams of the protected cotton mills and
woolen mills at Lowell and Lawrence and
Fall River, and the protected carpet factor-
ies at Clinton and Lowell and Worcester,
and the numberless other protected handi-
crafts in all the valleys and by all the water-
courses of Massachusetts—handicrafts which
have made that lovely, beloved, but exasper-

ating old State, so rich and prosperous and
powerful that she can shed her reformers
like water from a duck's back, and sail along
steadfast and stately under a shower-bath of
self-conceit and wrong-headedness that
would sink forty fathoms deep a weaker
commonwealth—it is amazing to see how
those enormous beams elude Mr. Clarke's
vision, while the mote of pig iron in the frater-
nal eye of Pennsylvania elicits such disap-
proval and disgust that he must stretch forth
his priestly hand across three States to pluck
it out.

I have before me a copy or compilation of
the existing tariff laws passed from time to
time, with their various modifications and
changes for more than half a century. It is
not a thrilling narrative. Mr. Clarke could
lay it down at any place without counting
the minutes before he should be able to
take it up again. I will not say that even
I myself, left to my own unassisted reason,
should not have surreptitiously skipped a
page or two here and there. But with the
aid of two experts in the tariff, citizens re-
spectively of the two largest manufacturing
States of the Union, I have gone through
the whole, line by line, and I find that of
the entire law, four lines out of every five
contain in some form a protection in favor
of some industry followed in Massachusetts,
and that out of all provisions of law contain-
ing special discriminations intended to pro-
tect American industry, five lines out of
every six contain something of interest and
value to Massachusetts. In short, Massa-
chusetts has built up her wealth and her
power out of manufacturing industries that
have waxed strong under the shelter of a
protective tariff. Among the listeners to
this shallow and shameless sermon there
may well have been some solid men of Bos-
ton, the web of whose fortunes was woven
in the carpet looms of Massachusetts. Did
no little monitor thump in their bosoms
while Mr. Clarke was bringing his railing ac-
cusations against the brethren of Pennsylv-
ania? Did no still small voice whisper in
their ears that the reason why most of us
cannot afford the Wilton carpets which our
souls long for is that they are protected by a
duty on the foreign article of the same grade
of "70 cents per square yard, in gold," and
in addition thereto 35 per cent. ad valorem,
in gold—thus practically doubling the price
of Wilton carpets to the American pur-
chaser and dooming us to ingrain for-
ever? For what is true of Wilton is in chief
measure true of Saxony and Aubusson, and
Axminster and Tournay and Brussels—all of
which are manufactured to great profit in
Massachusetts under the influence of these
enormous duties. How virtuous, how exem-
plary, how salved in conscience before God
and man must these rich carpet knights have
felt as they sat in their comfortable pews
and heard the crack of the clerical whip lay-
ing the 40 stripes save one on the backs of
the depraved ironmasters of Pennsylvania! With
what a fearful looking-for of judgment
and fiery indignation must the stock-
holders of the Bigelow Carpet Company
have witnessed that first tentative tilt against
the tariff, and with what a delicious sensa-
tion of relief must they have seen their dis-
creet shepherd judiciously lead his flock
beyond the green pastures of Worcester and
past the still waters of Clinton, to dash him-
self into a thousand pieces against a beetling
mass of Keystone pig iron. Like Moses
coming down from the Mount, so doubtless
they wist not that their faces shone with
delight, as they eagerly followed the trail of
their pastor into the Pennsylvania valleys,
beat their breasts black and blue over the
iniquity of the doomed ironmasters, and
rent the April skies with their fraternal
wailing, "Lord have mercy upon them,
miserable sinners!"

An Old Lock.

Mr. F. N. Brooke has presented to the
Commercial Exchange of Philadelphia the
lock and key of the town house of William
Penn, commonly known as "The Old Slate-
roof House," which was taken down for the
purpose of erecting upon its site The Cham-
ber of Commerce. The lock is described in
the "American Historical Record" as follows:
It is 20 inches long by 12 high and 3
deep, and is of wrought iron one-third of an
inch thick. It was not immediately fas-
tened to the door, but was attached to a
large iron plate by means of hooks, which
slid into staples in the plate. These latter
were bolted firmly on the door. The key is
a ponderous affair, ten inches long and well
proportioned, and went through a keyhole
in the plate, three and a-half inches long by
three-quarters of an inch wide. The bolt of
this lock is three inches long, two wide and
one and a-half thick, and the side pieces are
fastened to the lock-plate itself by means of
iron buttresses or knees securely and firmly
riveted. During all the years of its exist-
ence, from the close of the seventeenth cen-
tury until its demolition in 1867, the lock
and key here mentioned did nightly service
upon the street door of that famous mansion.
This building stood on the southeast corner
of Norris' alley, now Gothic street and
Second, a little south of Chestnut street, and
was built at about the year 1690 for Samuel
Carpenter. It was occupied as a city resi-
dence by William Penn about the year 1700,
and was the birthplace of John Penn, the
only child of William Penn, who was born
in this country. There Lord Cornbury,
Governor of New York, was entertained in
the year 1702. In 1703 it was sold to Wil-
liam Trent, the founder of Trenton in New
Jersey. For nearly fifty years afterward it
was the residence of many eminent persons,
among them Deputy Governor Hamilton,
when it became a boarding house. In it Gen.
Forbes, the successor of General Braddock,
died. There John Adams and other mem-
bers of the first Continental Congress
lodged; and there many British officers
lodged while the troops of General Howe
held possession of the city. When Arnold
was made Military Governor of Philadelphia
in 1778, he occupied it as his headquarters,
and there he gave those splendid entertain-
ments before and after his marriage with
Miss Shippen which involved him in debts
that became temptations to treason. As
compared with locks of the present time it is
a very clumsy affair, but it is doubtful if
many of those now made will have as long a
life of usefulness.

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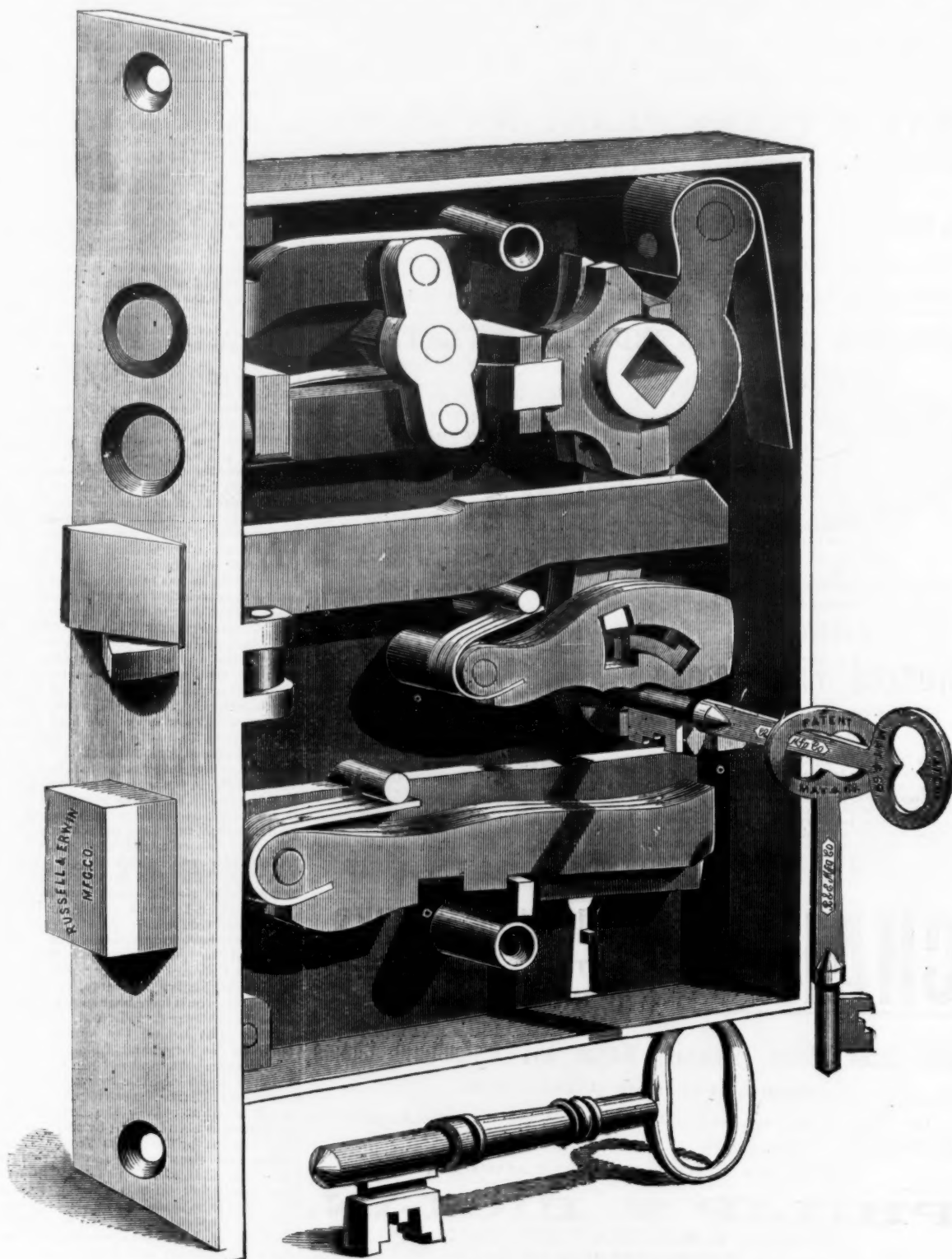
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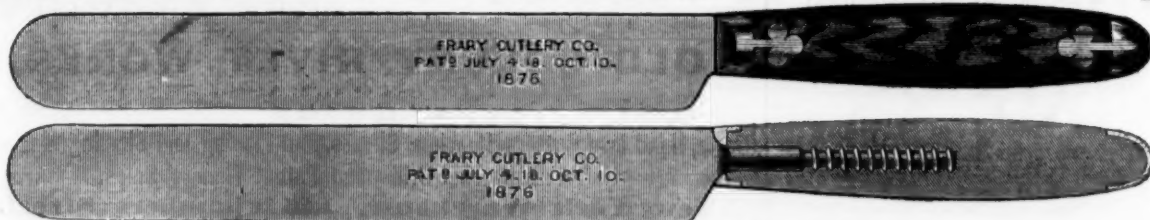
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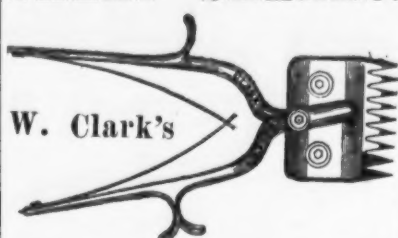
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English Workmen and their Strikes.

A correspondent of the Philadelphia
Ledger, writing from Manchester, England,
says:

On this (Good Friday) evening as we go to rest it is with a feeling of sadness. At the same time go to rest—an indefinite rest—more than 200,000 looms and 6,000,000 of spindles. One hundred and twenty thousand working people stop work, not for Good Friday and Easter Monday festivities, but expecting on next Tuesday morning to enter upon a struggle in which want, privation and even starvation are to many a contingency.

To the world outside, and especially to Americans, the causes which prompt these strikes in England are a mystery. Why common-sense, hard-thinking workmen, as Lancashire men are, should contend against the inevitable, and why lose their identity as men in the trade combinations and become integers in a faction, is hard to understand for any one who does not look below the surface of passing events.

The Lancashire cotton manufacturing firms have decided that a reduction of 10 per cent. shall be made in wages. The spinners and weavers contend that over-production is the cause of the present depression, and that the hours of work should be lessened, but not the rate of wages. This is the dispute, and, as before said, we are on the threshold of one of the greatest among a hundred or more strikes which, during the year past, have been the most marked feature in British industry.

The economic conditions which surround the industries of England at this time seem as little understood and appreciated here as those which apply to the Eastern complications. In neither case can an Englishman realize the great changes which a decade or two has brought about, and national pride, or bigotry—to use a harsher but truer name—prevents that insight into present circumstances which people less learned can discern without difficulty.

Leaving out for the present particular facts, and reverting to the general conditions of skilled industry in England and America for example, how is it possible for this country to maintain its place, loaded as it is with impediments which there seems no hope of removing. The land for example, that great factor of wealth and resources in nearly all countries, is in England an element almost non-productive. Its earnings, what they are, go for the most part to the maintenance of a non-producing, extravagant class, who eat the bread of idleness. The revenues of the country have been adroitly shifted from the land to the industrial and commercial interests, until the load has become too great to bear. The industries of England were founded under circumstances which, measured by those existing in these times, were fortuitous and accidental—founded when the social system of this country, the patriarchal method we will call it, was a suitable one to promote industry; but now skilled labor is different, and its power as a system must, for the present and future, be governed by an equality of human conditions that is co-operation instead of classification.

This co-operative system of the whole people moving together with one aim is possessed in varying degrees by several countries we could name, but especially by America, and when to this leading condition we add the next most important, that of natural resources, how is England to compete? Privilege has been maintained by concession after concession to the industrial classes, until the position of an employer of labor, or even "lords of the manor," is in independence far below what it would be in America; and the most singular feature in the present strike, as treated in the newspapers, is that the problem has two sides of indeterminate equity—has a mill owner the right to say how much he will pay for labor, and have workmen a right to set their own price on their labor? Free trade this!

Within an hour of penning this the writer passed through some of the districts peopled with what are called "cotton operatives," and in scanning the faces and noting all around, was impressed with that great truth laid down by Thomas Buckle, that the circumstances of a people or nation permit of what can be called a "normal line of civilization," and to raise one part of the people above this line must depress a greater number below it. These are not the words but the idea, as remembered from a reading of some years ago. An application in various countries of the rule will prove its truth. The Lancashire "operatives"—those who are not called upon to use much skill in their work—are a class depressed "below the line," much below, and so low that traits have developed a physiognomy even. England has violated a law of human progress, the onward struggle toward an equality of human rights and human conditions. She must pay the penalty in a loss of her industries, which, as conducted in these modern times, depend upon the conditions and intelligence of the masses, not of leaders and schemers.

Brilliant Zinc Coating on Brass and Copper.—The following simple process is recommended by Bottger: Boil a large excess of so-called zinc dust some time, with a concentrated solution of caustic soda, or potash, and place the copper or brass articles to be coated in the boiling liquid. By continuing the heating, after a few minutes a beautiful, mirror-like film of zinc will form upon them by the decomposition of the alkaline solution, in consequence of their electro-negative character in combination with the zinc. It is suggested that the process is applicable to the preparation of disks for dry-piles, and also for forming a layer of tombac, by heating a copper article thus coated, carefully, to about 248° to 254° (best under olive oil), when the zinc will unite with the copper support to form a gold-tinted tombac, and the article need only be quickly cooled in water, or some other suitable liquid, as soon as the desired color is apparent.

Messrs. W. H. McCurdy & Co. have removed to the offices in the National Bank Building, corner Superior and Water streets, Cleveland, formerly occupied by the Sun Insurance Company.

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Moore's Anti-Friction Hay Fork Pulley.

The main wheel contains four anti-friction wheels which revolve upon axles fast in its sides. The main wheel revolves nine times while the anti-friction wheels are revolving once.

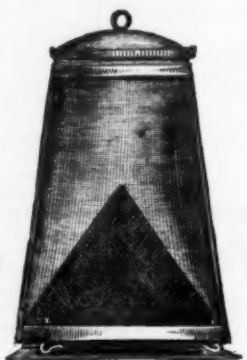
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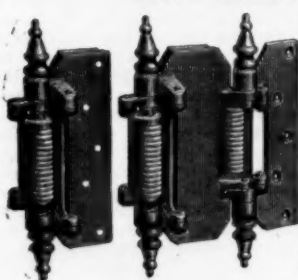
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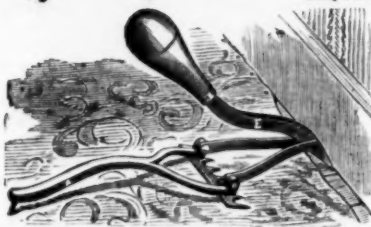
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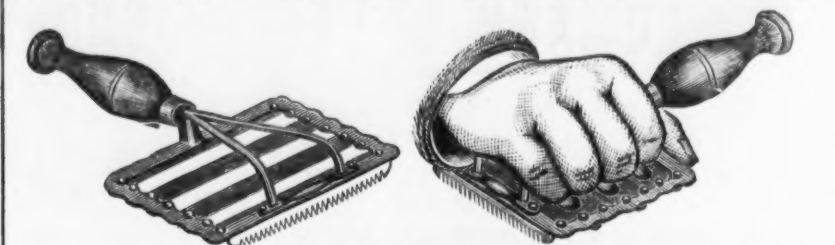
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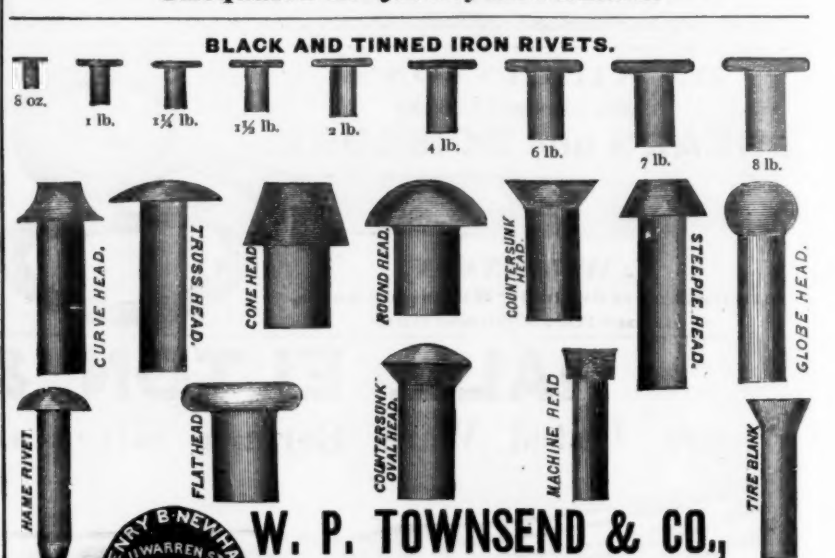
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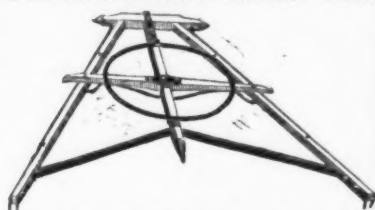
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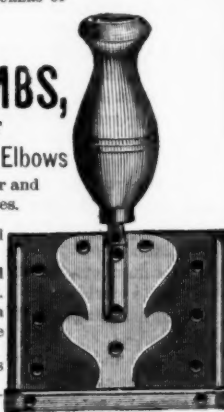
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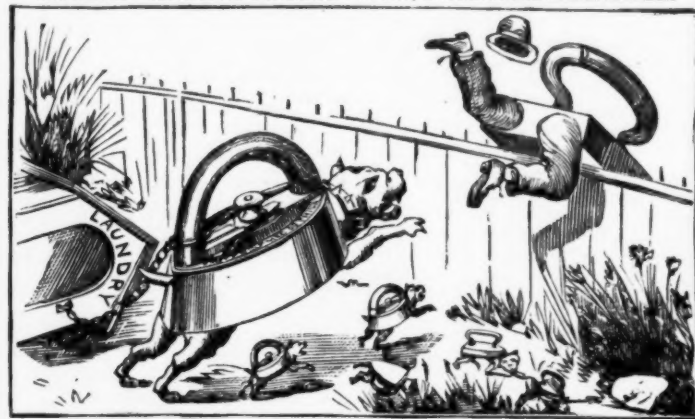
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on the outside of the
nose. No sharp points
in the nose to keep it
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finish, polished trim- each. 7 doz.
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SPRINGS.—The most durable and cheapest Door Spring yet made. LEAD PIPE
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Please send for circulars and prices.

The Iron Age.

New York, Thursday, May 16, 1878.

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The American Hardware Company, Melbourne, are our agents for Australia. Sample copies will be mailed by them, free of charge, to any firm engaged in the trades we represent in Australia, Tasmania and New Zealand.

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Fiftieth Page.—The Iron Age Directory.

mately interrelated and interdependent, that what affects one to a greater or less extent affects all; and manufacturers who consent that others shall suffer so long as they are not interfered with, are short sighted indeed. There is no safe course in dealing with such a measure as Mr. Wood's bill except to oppose it unconditionally and as a whole. Every effort should now be directed to secure its immediate defeat and to prevent the postponement of its consideration. If it is defeated we shall know what to expect for the next two years at least; if postponed until next winter its discussion may drag along through the next session, disturbing business, unsettling confidence, paralyzing industry and depressing wages. We have vastly more to fear from Congress than from the gentlemen who wave the red flag and shout *Vive la Commune!*

Anglo-American Trade and the Menace of War in the East.

An examination of the statistics of the Treasury Department for the fiscal years 1875-'76 and 1876-'77 shows that our trade with foreign countries, leaving out the precious metals, has been as follows:

IMPORT AND EXPORT OF GOODS FROM AND TO EUROPE AND NON-EUROPEAN COUNTRIES.
In Millions of Dollars.

Europe.	Import.		Export.		Total Trade.	
	Domest.	Foreign.	Domest.	Foreign.		
Fiscal years.	1875.	1877.	1875.	1877.	1875.	1877.
Austria	0.5	0.4	1.6	2.7	2.1	3.1
Belgium	5.5	6.1	16.1	18.2	21.6	24.3
Denmark	0.4	0.1	0.8	0.3	1.2	0.4
France	51.5	50.4	46.0	48.3	97.5	98.7
Germany	35.5	33.0	51.1	58.1	86.6	91.1
England	125.0	135.0	36.5	36.6	161.5	171.6
Greece	0.3	0.1	0.2	0.1	0.5	0.2
Italy	7.5	7.1	7.8	8.5	15.3	15.6
Holland	2.4	2.5	13.2	10.4	15.6	12.9
Portugal	0.2	0.1	0.1	0.1	0.3	0.2
Russia	1.0	0.5	11.7	4.3	12.7	4.8
Spain	2.4	2.3	10.1	10.5	12.5	12.8
Sweden & Nor.	1.0	0.3	1.5	3.0	2.5	3.3
Total	234.2	238.7	252.7	253.5	486.9	492.2
Other countries	1875.	1877.	1875.	1877.	1875.	1877.
Argentina Rep.	3.6	3.4	1.5	1.1	5.1	4.5
Brazil	45.5	43.5	7.3	7.5	52.8	51.0
Central America	1.8	2.9	1.0	1.3	2.8	4.2
Chile	0.3	0.7	1.2	2.2	1.5	2.9
China	12.4	11.1	1.4	3.3	13.8	14.4
Danish W. Ind.	0.4	0.3	0.2	0.7	0.6	1.0
French colonies	2.1	2.5	2.3	2.1	4.4	4.6
Nova Scotia & N. Brunswick	3.4	3.8	5.7	6.1	9.1	9.9
Quebec, Ont. & C.	2.4	2.0	2.0	2.0	4.4	4.0
British Columbia	2.2	1.8	1.3	1.1	3.5	2.9
Newfoundland and Labrador	0.2	0.1	0.6	1.0	0.8	1.1
British West Ind. & Honduras	3.4	6.4	8.2	7.5	11.6	13.9
Australasia	1.5	1.5	3.0	5.8	4.5	7.3
British Guiana	1.2	3.5	1.8	1.9	3.0	5.4
Brit. East Ind.	12.8	10.4	0.4	0.9	13.2	11.3
Hong Kong	0.5	1.2	0.2	0.2	0.7	1.4
Cape G'd Hope	1.0	1.0	1.7	1.4	2.7	2.4
Hayti	5.0	5.3	4.7	3.9	9.7	9.2
Japan	15.5	13.7	10.5	12.8	26.0	26.5
Liberia	0.1	0.1	0.2	0.1	0.3	0.2
Mexico	12.5	15.4	4.7	4.5	17.2	20.0
Dutch West Ind. & Guiana	0.7	0.7	0.9	1.0	1.6	1.7
Dutch East Ind.	6.0	4.5	1.2	2.7	7.2	7.2
Peru	1.4	1.5	1.2	1.3	2.6	2.8
Portuguese Col.	0.1	0.1	0.3	0.4	0.4	0.5
Asiatic Russia	0.4	0.6	0.7	0.1	1.1	0.7
St. Domingo	0.4	0.6	0.7	0.1	1.1	0.7
Sandwich Isl. d.	1.4	2.5	0.8	1.3	2.2	3.8
Cuba	57.7	67.7	13.8	12.8	71.5	80.5
Porto Rico	4.3	4.5	2.2	2.4	6.5	6.9
Colombia	5.5	5.5	4.1	4.1	9.6	9.6
Uruguay	0.9	7.4	3.4	3.1	8.3	10.5
Venezuela	5.9	7.4	3.5	3.2	9.4	10.6
Other non-European countries	0.9	0.5	0.8	0.9	1.7	1.4
Total	242.4	243.9	266.5	266.4	508.9	510.3

From the foregoing it will be seen that our foreign trade was distributed as follows:

	Fiscal Years.	
Europe.....	1876.	1876.
America.....	768.5	784.9
Asia.....	292.5	304.4
Africa.....	69.3	77.2
Oceania, Australasia and Sandwich Islands.....	5.1	4.5
	7.8	11.5
Total.....	1,413.2	1,482.5

If we except Africa, it will be seen that there has been a notable increase in every direction.

The following are the details of our trade with American countries, stated in millions of dollars:

Countries.	Import.		Dom. & Foreign Export.		Total Trade.	
	1875.	1877.	1875.	1877.	1875.	1877.
Argentina Rep.	3.6	3.4	1.5	1.1	5.1	4.5
Brazil	45.5	43.5	7.3	7.5	52.8	51.0
Central America	1.8	2.9	1.0	1.3	2.8	4.2
Chile	0.3	0.7	1.2	2.2	1.5	2.9
China	12.4	11.1	1.4	3.3	13.8	14.4
Danish W. Ind.	0.4	0.3	0.2	0.7	0.6	1.0
French Colonies	2.1	2.5	2.3	2.1	4.4	4.6
Nova Scotia & N. Brunswick	3.4	3.8	5.7	6.1	9.1	9.9
Quebec, Ont. & C.	2.4	2.0	2.0	2.0	4.4	4.0
British Columbia	2.2	1.8	1.3	1.1	3.5	2.9
Newfoundland and Labrador	0.2	0.1	0.6	1.0	0.8	1.1
British West Ind. & Honduras	3.4	6.4	8.2	7.5	11.6	13.9
Australasia	1.5	1.5	3.0	5.8	4.5	7.3
British Guiana	1.2	3.5	1.8	1.9	3.0	5.4
Brit. East Ind.	12.8	10.4	0.4	0.9	13.2	11.3
Hong Kong	0.5	1.2	0.2	0.2	0.7	1.4
Cape G'd Hope	1.0	1.0	1.7	1.4	2.7	2.4
Hayti	5.0	5.3	4.7	3.9	9.7	9.2
Japan	15.5	13.7	10.5	12.8	26.0	26.5
Liberia	0.1	0.1	0.2	0.1	0.3	0.2
Mexico	12.5	15.4	4.7	4.5	17.2	20.0
Dutch West Ind. & Guiana	0.7	0.7	0.9	1.0	1.6	1.7
Dutch East Ind.	6.0	4.5	1.2	2.7	7.2	7.2
Peru	1.4	1.5	1.2	1.3	2.6	2.8
Portuguese Col.	0.1	0.1	0.3	0.4	0.4	0.5
Asiatic Russia	0.4	0.6	0.7	0.1	1.1	0.7
St. Domingo	0.4	0.6	0.7	0.1	1.1	0.7
Sandwich Isl. d.	1.4	2.5	0.8	1.3	2.2	3.8
Cuba	57.7	67.7	13.8	12.8	71.5	80.5
Porto Rico	4.3	4.5	2.2	2.4	6.5	6.9
Colombia	5.5	5.5	4.1	4.1	9.6	9.6
Uruguay	0.9	7.4	3.4	3.1	8.3	10.5
Venezuela	5.9	7.4	3.5	3.2	9.4	10.6
Other non-European countries	0.9	0.5	0.8	0.9	1.7	1.4
Total	184.1	198.1	108.4	106.5	292.5	304.6

It thus appears that Cuba and Porto Rico alone made up for the entire decrease in our dealings with the Argentine Republic, Brazil, the Danish West Indies, Hayti and the British provinces. The following tables show our trade with other non-European countries, in millions of dollars:

Countries, in millions of dollars :							
	Import.		Dom. & Foreign Export.		Total Trade.		
	1876.	1877.	1876.	1877.	1876.	1877.	%
Asia.							
China.	12.4	11.1	1.4	3.4	13.8	14.5	2.7
Hong Kong.	0.5	1.2	1.2	15.0	11.7	16.2	4.5
Japan.	10.5	10.7	4.9	12.2	15.4	22.9	1.6
India.	13.5	13.7	2.7	3.7	16.2	17.4	0.6
Dutch E. Indies.	6.0	4.5	0.6	2.7	6.6	7.2	0.6
British E. Indies.	1.0	1.0	0.1	0.1	1.1	1.1	0.0
Malacca.	0.4	0.4	0.9	1.0	1.3	1.4	0.1
Siam.	0.1	0.1	0.2	0.1	0.3	0.2	-0.2
Philippine Islands.	0.1	0.1	0.2	0.1	0.3	0.2	-0.2
Russia.	1.0	1.0	0.2	0.1	1.2	0.9	-0.4
Total.	43.3	40.0	16.0	28.3	69.3	77.2	9.7
Africa.							
Capo of G. H. . .	1.0	1.0	1.7	1.4	2.7	2.4	-0.9
Liberia.	0.1	0.1	0.2	0.1	0.3	0.2	-0.1
Port. colonies.	0.1	0.1	0.3	0.4	0.4	0.5	0.1
Other colonies.	0.0	0.5	0.5	1.7	1.4	2.2	0.5
Total.	2.1	3.7	3.0	3.8	5.1	6.5	0.1
Oceania.							
Australia.	1.5	1.5	4.0	5.0	5.5	7.4	1.9
And. Islands.	1.4	2.6	0.9	1.5	2.3	4.1	1.8
Total.	2.9	4.1	4.9	7.4	7.8	11.5	3.7

region are the blackbands—bituminous shales charged with iron ore. Previous to the explorations of Prof. Andrews, the only blackband recognized in the district was that over coal No. 7, until a very important deposit, ranging in thickness from 7½ to 10 feet, was discovered by him over coal No. 5 at three different points, distant from each other 1½, 1 and 2 miles respectively. The following analyses show the nature of the ore at two of the most important exposures:

	1.	2.
Silice acid.....	55.38	54.16
Volatile matter.....	13.30	20.06
Carbonate of iron.....	45.86	33.50
Sesquioxide of iron.....	7.40	9.14
Alumina.....	0.50	5.75
Manganese.....	3.10	1.85
Carbonate of lime.....	1.50	0.95
Carbonate of magnesia.....	3.35	4.20
Sulphur.....	0.17	0.30
Phosphoric acid.....	0.095	0.035
Phosphate of lime.....	.....	.....
	99.705	100.045
Metallic iron.....	27.33	25.62
Phosphorus.....	0.043	0.018
Iron in calcined ore.....	45.94	35.08

Analyst: Prof. Wormley.

This ore compares very favorably with the well-known blackbands of Tuscarawas county, the probable geological equivalent of which has been discovered since Prof. Andrews' report was written in considerable bodies in the neighborhood of Moxahala, only a short distance from where the great seam of coal appears in Upper Sunday Creek.

The accurate tracing of coal beds covering large areas, the great importance of a correct appreciation of the nature and the value of their contents for various industrial and domestic uses, and the careful determination of the geological and chemical features of iron deposits, are matters which urgently require thorough examination, as they affect the prosperity of large districts. Much has been accomplished in this direction, but much still remains to be done, as it will only be when our mineral regions are correctly mapped in detail and an inventory of our resources has been made, that a safe basis will be offered to industrial enterprises on a large scale. Ohio has not been behind her great sister States in this respect, having one by one added to the list of her mining districts. Though at present affected by general depression, these districts are destined to become the centers of producing regions the rapid development of which will depend upon the caution and energy with which natural advantages are used and obstacles overcome.

We learn on undoubted authority that the Providence Tool Company have received money sufficient for the completion of the old contract with Turkey for the manufacture and delivery of 600,000 stand of arms. This is the entire substance of a sensational report in one of the morning papers, alleging that a contract has been made with the Russian government, &c. With this cash in hand the Providence Tool Company have started up their works with a full force, and in addition they will feel at liberty to forward to their destination a large quantity of arms already finished and paid for, but held as a security for a full compliance on the part of Turkey with the original stipulations. The original contract called for 600,000 stand of arms, of which it is understood about 400,000 have been delivered, leaving 100,000 on hand, as above explained, and 100,000 more to be made on the order. Those who are unusually well-informed surmise that there may be a secret understanding between Turkey and Russia, by which the balance of the arms due will be turned over to the latter. Parties in this city who are in constant communication with St. Petersburg, and have facilities for obtaining information current in military circles there, deny positively that any contract has been made with Russia for the manufacture of arms in this country or that there is likely to be any.

Mr. Chas. Francis Adams, Jr.'s, views on the railroad problem, as stated in a paper we print in this issue, will be read with interest. Mr. Adams does not believe that the evils growing out of our present railroad system will be corrected by competition, but that such reforms as are needed must be effected by placing the companies under the restraints of law. Unfortunately, where the power of the law is involved we are likely to witness the spectacle of the engineer hoist with his own petard. The organized power of the railroad is formidable when employed to control legislation, and the danger is that the laws with which we seek to bind them may become barriers for their protection against the will of the people. Probably we shall never have an ideally perfect system of railroad management, but it is quite certain that there are few evils thereunto appertaining which can be permanently and satisfactorily remedied by the simple expedient of "be it enacted." Our laws are subject to constant revision, and when we invoke legislative power to help us we may call up a Frankenstein that will not down at our bidding. Competition has effected important reductions in freights already, and we can better trust it to reform evils affecting the public interest than pin our faith to the wisdom of the bucolic Solons who gather in our State capitals to make laws.

We give this week in another column a synopsis of the Italian tariff. This is one of a series of tariff abstracts which we have prepared at much expense and trouble. We shall give in turn the tariffs of all the foreign countries with which we have important commercial dealings, taking care in every

case that they are corrected by the latest official tariffs. These compilations are very valuable, and those which precede, as well as those which follow, should be preserved for reference by all who are interested in exporting American manufactures.

Mr. R. F. Mushet's letter to the Secretary of the American Iron and Steel Association on the purification of phosphoric cast iron will be read with interest. Mr. Mushet believes that Mr. Geo. I. Snelus of Workington has successfully solved this problem by the use of lime in the Bessemer process, and has also opened the way for the manufacture of soft steel "possessing all the peculiar excellences of wrought iron without any of its defects." Mr. Mushet thinks that with the attainment of these results the puddling furnace, with all its defects, may become a thing of the past.

The article we print in another column on combustible dust as an explosive is interesting and curious. The facts stated are important for manufacturers to understand, as they show the danger to be apprehended from defective ventilation in factories in which dust-producing processes are employed.

Mr. Samuel Barnett's paper on metric reform, which we print on another page, contains many useful suggestions which those interested in securing the introduction of this system will find of interest and value.

New Publications.

A HANDBOOK OF VOLUMETRIC ANALYSIS. By Edward Hart, S. B. Published by John Wiley & Sons. Price 75c.

For the daily recurring chemical working tests, which are becoming more and more a necessity in many manufacturing establishments, and in all metallurgical works, no method of analysis is so peculiarly adapted to the requirements of the majority of cases as the volumetric. Titrations by standard solutions obviate the necessity of repeated weighings, and for many determinations possess a degree of accuracy which gravimetric methods have not reached. Though the results obtained cannot always claim to be scientifically correct, they are approximations which serve all the purposes of tests made to control work performed on a large scale. For the latter case it is possible within a reasonably short time to train a person of average intelligence, though without chemical knowledge, to perform the work. These reasons have made the examination of volumetric methods a pursuit to which many eminent chemists have devoted much time and careful research. Their labors have met with warm appreciation from those whose every-day practical routine excluded the possibility of individual investigations. The great importance of the subject gives value to the text-book before us. The work of Mr. Hart, though designed for the use of colleges and technical schools, will well meet the demands of engineers and manufacturers. The author, who does not aim at the fullness of detail of such exhaustive works as Mohr's famous treatise, has sought brevity on every page, directing the attention of the students to more extended sources of information by frequent references. In the first part of the work the author gives a good account of the instruments, the preparation of solutions and general methods. The second is an elaboration of the best methods proposed for each of the elements and their most important compounds. The estimations of soda and potash, of manganese, iron, copper, silver, nitric acid, &c., are dwelt upon more fully, because they are frequently, and in some cases exclusively, used. In a third part the author gives some examples of analysis as carried out volumetrically for industrial purposes. The work is fully illustrated and clearly printed. We recommend it to those of our readers who wish a guide in making volumetric analyses, as a work which to the practical metallurgist is sufficiently elaborate to aid him in the introduction of chemical checks upon every-day work.

Heavy Stamp Mills for Peru.—The gentlemen from Peru representing the Oroya silver mines, recently spoken of in these columns as having arrived in New York in search of improved mining machinery, gave an order a few days ago for an 80-stamp mill, the first of a number intended for the Cerro de Pasco mines, with which the name of the late Henry Meigs has been so long associated. Mr. Meigs' project included a line of railway from the seaboard to the mines, for the transportation of the ore. The railway from Lima to Oroya, 30 miles in length, is nearly finished. Sixty miles more from Oroya to Cerro de Pasco must be built, and the great tunnel now in progress on this part of the route will be carried forward to completion. The New York agents say that as soon as financial arrangements can be made the work will be resumed with vigor. Great things are predicted when once the old-fashioned methods heretofore employed have given place to the latest improvements. The mill ordered will be ready for shipment July 1st, and will be one of the most complete ever built.

Guards for Elevated Railroads.—More in deference to public sentiment than to any supposed necessity, the Gilbert Elevated Railroad Company have just decided to put an improved guard along each of the tracks of their road for increased security. An army of men is employed on it, so the engineer says, and they hope to finish the work in ten days, slightly delaying the opening of the road for business. This guard consists of a timber 7 by 8 inches, bound on the side nearest the track with bar iron ½ by 2½ inches, bolted on, so that in case of any tendency to leave the track the wheels would sheer off back to the track again. Two more engines arrived yesterday from Paterson, N. J., so that up to the present time the company have received four out of twenty engines and twenty out of sixty cars, which will constitute their rolling equipment.

Scientific and Technical Notes.

A valuable note has been presented to the Royal Academy of Sciences of Belgium by Prof. J. Delboeuf and D. Spring on

NATURAL AND ARTIFICIAL COLOR-BLINDNESS.

In order to explain the curious phenomenon of color-blindness, or Daltonism, Young and Helmholtz have formulated the following hypothesis: The eye possesses three kinds of nerve elements, which, excited separately, cause the sensations of red, green or violet, these colors therefore being the subjective fundamental ones. The colors of the spectrum as well as compound colors would accordingly have the property of exciting, simultaneously, but in varying proportions, each one of these specific energies; red, for instance, would only feebly affect the violet and green elements, but would strongly agitate the red ones. It would be understood from this theory that no natural color, however it may be, even though it were one of the colors of the spectrum, which are acknowledged to be the purest we know, would create a truly simple sensation; the colors seen always comprise red, green or violet, although the true color may contain only one or two of them. This hypothesis applied to color-blindness would give as the cause of the phenomenon the absence of one or two of these three energies, the most frequent being that of the red. Without discussing the objections which may be made against this hypothesis, a modification may be added which naturally suggests itself. It is possible that with those who are color-blind the red elemental nerves are not entirely paralyzed, but that the green and violet simply predominate. If this supposition were correct, it would follow that in placing between the eye of one color-blind and the light a transparent substance colored red, it would be possible to establish the equilibrium, because by such means a part of the green and violet rays is extinguished. The substance first used was fuchsine. Experiments were made with silk ribbons, chosen by a person who was color-blind. It was notably a bright red which he could not distinguish from a certain brown, and a violet which made upon him the same impression as blue. The interposition of fuchsine prism produced a remarkable effect upon all color-blind persons examined. The colors which they confounded usually were not only notably different, but the color and tone of blue or brown remained almost intact; while violet, and especially red, acquired an aspect and a brilliancy entirely unknown to them. In order to prove that this was not only the effect of contrast, a piece of ribbon was so placed that it was seen both by the naked eye and through the prism. It might be thought that any red substance must produce an effect similar to that of fuchsine and that a substance of a different color, violet, for instance, would possess no favorable action. Such is not the case; aniline violet, and eosine, which is orange, correct color blindness also, though less powerfully. On the other hand, a glass colored red by oxide of copper has no other effect but to tarnish all colors but the red. Only those substances give the astonishing results just described, which, seen through a spectroscopic, extinguish the green part of the spectrum and that only. Another interesting fact of quite a different nature is the following: Among the ribbons was one colored green (called malachite green by the manufacturer); after a person, color blind, so that he could not distinguish a cherry red and a certain gray, had looked at the green color for a while he was able to distinguish the two colors mentioned. The question at this stage of the experiments was whether it would be possible by weakening the rays other than green to produce artificial color-blindness. By experimenting with a solution of chloride of nickel in water (1-25), it was found that those with perfect eyes saw the violet become blue, the red brown, and nature assuming a certain uniform tone without any striking lights. In this case, also, it must not be believed that any substance of the same color as a chloride of nickel solution may be substituted for it. Green composed, for instance, by mixing blue and yellow have no effect. A valuable corroboration is the fact that fuchsine re-establishes ordinary eyesight of a person who is temporarily made color-blind through the agency of chloride of nickel. If the person has placed between his eyes and the ribbons a sufficiently thick layer of the chloride of nickel, so that ribbons, whether red or brown, whether violet or blue, appear to him brown or blue, and then besides interposes between his eyes and the objects mentioned a prism of fuchsine sufficiently thick, the colors will appear with their distinctive characteristics.

The valuable properties which an addition of phosphorus confers upon bronze, copper, tin and probably other metals, will make the following data, published by M. Sidot in the *Comptes Rendus*, on the preparation of

PHOSPHIDE OF COPPER

interesting. Phosphorus is made to act upon a heated concentrated solution of sulphate of copper. After one hour's boiling the solution loses its color if there is phosphorus in excess. In this case the liquid is either decanted and replaced by a fresh solution of the copper salt, or crystals of sulphate of copper are added to the boiling liquor until it retains its color. The solution is then decanted, and the residue is washed until no trace of acid can be detected in the water. The precipitate is spread on cloth and dried over at a low temperature. By this process pounds of black phosphide of copper may be made in a few hours. The product obtained should be black; it must not, as sometimes is the case, be greenish. The phosphide thus obtained is not decomposed either by exposure to the air or by contact with water. It melts at a red heat, losing about 10 per cent. of its weight. A grayish white metallic button is obtained, so brittle that it may be reduced to powder under a hammer; but if the temperature is raised considerably, a part of the phosphorus is expelled, and after cooling a white mass is obtained, which is as hard as steel. The black phosphide of copper possesses the valuable property of permitting the easy addition of known quantities of phosphorus to metals, whose qualities,

as is well-known, are thereby materially improved.

THE FOLLOWING PRACTICAL SUGGESTIONS ON

CHIMNEY LIGHTNING CONDUCTORS

are taken from a paper read by Mr. John Morrison before the Tyne Chemical Society: It is well known that some bodies oppose more or less effectually the passage of electricity, while others again permit it more or less readily, and that there are, consequently, two classes of material with which we have to deal—one of the glass and gutta-percha type, called insulators, and the other of the metallic type, styled conductors, the terms, of course, not being absolute. It is also pretty familiar that when an insulated conducting body and an electrically excited one are made to approach, the former becomes excited by sympathy. This excitement is called induced electricity. The latter is the action which affects high buildings projecting into the atmosphere. When a thunder cloud comes near they become excited in proportion to their conductivity. Consequently, there is more danger of a lightning stroke when such projections are capped with metallic conductors than when they only consist of brick or stone, which are bad conductors. It follows, therefore, that it is possible to make a conductor a source of danger rather than a means of protection, and it is my belief that half the chimney conductors in existence are really more dangerous than serviceable. The mischief done by lightning is caused by its determination to force a passage to the earth through bad conductors, such as stone or brickwork. There can be no danger in the case of good conducting bodies with proper earth contact, excepting they be too small. Then the damage will be probably confined to their injury by heating or destruction by melting. Lightning, when it strikes, takes the course to the earth which offers the least resistance, which in a properly protected chimney is, of course, the conductor. This it passes quietly down and leaves the chimney itself untouched. I had been in the habit of using insulated copper ropes till I erected the "Atlas" chimney, when I went in for one of Sanders & Proctor's ¾ by ¾ inch copper staples, attached to the chimney with ordinary staples, which I now consider a very good and convenient form of conductor. The important thing, however, is not so much the form, or the insulation of the intermediate supports, as to see that each terminal is in order. This should, in spite of any little inconvenience, be ascertained personally. The upper terminal rod should be attached to the chimney cap, if a metallic one, and its lower extremity be in perfect continuous connection with the rope, rod or tape. Its upper end should project a few feet over the chimney summit, and should be spread out into or be provided with a number of points. The earth terminal should first be threaded through one or more lengths of cast-iron pipe and then attached to a large piece of old metal carefully imbedded in the damp soil. The pipe is merely a provision against the injury or corrosion of the buried portion of the rope or tape. The great danger is when, as is frequently the case, the connections are broken, and the rope is allowed, perhaps for months or years, to flap idly about in the wind. To reduce the danger of this I have sometimes thought of inclosing a wrought-iron tube or rod within the substance of the brickwork, but the idea is one I have not yet carried out. Its advantage, besides that of protection from the weather, would be in its perfect straightness. The efficiency of external conductors is I fancy frequently marred by their being closely bent to conform them to the intricate angles and curves of caps and cornices.

A subject which is attracting much attention in England is the introduction of

STEEL FOR SHIPBUILDING.

W. W. Kiddle, in the *Nautical Magazine*, points out difficulties a careful consideration of which cannot fail to benefit the advocates of steel ships. The introduction of steel in lieu of iron for shipbuilding purposes will, if successful, enable the merchant to have a vessel 20 or 30 tons per cent. under the present weight—no mean advantage in trades where the carriage of deadweight forms the most remunerative portion of his business. The innovation will have to be conducted with more than ordinary skill and care, from the fact that a rent, which might be of no practical importance in a bridge or viaduct, might be fatal to a ship. The latter is subjected to strains which test the peculiar qualities of the materials forming the hull in a very marked degree; so much, indeed, that an unusually large factor of safety is adopted by all the great corporations when laying down their rules. Experience and careful study have barely mastered the laws which are necessary to be observed for the safe construction of iron vessels, which have to be adapted in order that a higher classed metal may be introduced. Great difficulties are certain to be met with at the outset. One of these—corrosion—appears to be almost insurmountable, and likely to deter ship owners and ship builders from bringing it into extensive use. There are others which, in a practical point of view, will always cause anxiety, such as docking, or lying in the tideway of a rapid river, notably the Mersey or the Thames, during strong spring floods and gales. The rough knuckles of granite quays on a lee shore require a ship, when docking, to possess other qualities than elasticity and tensile strength, if her sides are to be preserved from bulging, or even fracture. Therefore, in making reductions, the laws of stiffness will have to be considered as well as the laws of strength, not only in what has now been mentioned, but in another respect still more important, which the reader will not doubt readily comprehend. The ship being a huge girder, with a top and bottom flange, and a connecting web in the form of top-siders, it is of the utmost importance for the true working of the machinery that all possible rigidity should be given to it. This cannot be secured without a certain thickness of the material employed, for, however great the tensile strength may be, it is only one of the indispensable factors demanded. The stems of the magnificent steamships of the White Star Line, during heavy weather, appear to rise and fall through an arc of 8 inches, as measured by an imaginary line, on the break of the fore-castle, by an observer close forward. A

stronger but more ductile material would probably increase this to a dangerous extent. It is therefore evident that great caution and careful experiments will be required before steel can be largely introduced in the plating of the larger class of steamships employed in heavy carrying, and, it may be added, heavy driving trades. The breadth of lap in their steel plates might probably be increased with advantage in double riveting for stiffening purposes, but not in single, for the calking of the seam would present greater difficulties in the latter than it now does. It would not be desirable, for this reason, to have a greater distance between the edge of the plate and the periphery of the rivet than what is universally allowed by scientific and practical men to be the best for all purposes. The mail steamers on the Atlantic cannot, without serious risk, reduce the thickness of the plates near the water line, owing to the danger of penetration by ice, which, in spring, may not only be found in the neighborhood of the Grand Banks, but in all the great commercial estuaries from the Chesapeake to the shores of Newfoundland. Anderson, in his highly useful manual, says there are no reasons for believing that iron is more brittle in winter than in summer, but qualifies the statement by adding that his experiments were made under cover. It is certain that seamen will not share his opinion, for they have a great dread of the action of intense frost on the plating at the water line when steaming through an ice field, especially if it be in hummocks, or greatly denuded by the weather. In this condition it assumes a lustrous greenish hue, not unlike the tint of the glass which still may occasionally be seen in the cottages of rural districts. At this stage, granite scarcely surpasses it in hardness, and numerous accidents bear out the accuracy of the seaman's reasoning. In the winter of 1874-5, a large percentage of steamers in the North American trades met with serious damage to their bows or propellers, and one, the Vicksburg, burst the plates under the counter, and foundered in the vain attempt to back out of the pack. Of course the theory nursed by seamen may be erroneous, but they are so thoroughly imbued with its correctness that only practical tests will convince them that their assumption is founded on prejudice. There are good reasons for believing that until experiments have convinced the shipbuilder of the degree to which he may test steel, it will only be largely used in the construction of men-of-war of certain classes, and packets for Channel service. In both, expense is not so much an object as lightness and efficiency, and neither are much subjected to the rude tests of strength which so frequently try the ordinary merchantman. Further, the cargoes of mail packets are seldom heavy, neither is space such an object as to prevent all the important parts of the hull from being made accessible for scaling and painting. Experience demonstrates that when this is carefully carried out, there is practically no limit to the duration of the plate. Whether Nature really holds in her laboratory an antidote to oxidation is uncertain, but we do know that up to the present time the highest chemical science has failed to find one. The greatest scientists have not been rewarded with a glimmer of success, although pretenders of all denominations essay to make the world believe they have solved the great problem.

In order to compare the

INTENSITY OF TELEPHONIC SOUNDS

with the intensity of the primitive sound, M. Demogot has recently made some interesting investigations, an account of which we find in *La Nature*. Two telephones were employed, one of which the operator held to his ear, while into the second instrument an assistant repeated a given syllable with a uniform intensity of voice. The sound transmitted by the telephone, and also that reaching the ear directly, were both heard, and it was thus easy to make a comparison between them. At 283 feet distance the intensities appeared equal, the vibrating plate being held at a distance 1.9 inches from the ear. The relation of the intensities was then as 25 to 81,000,000, or, in other words, the sound transmitted by the telephone was only about one three-millionth of the sound emitted. "But," adds M. Demogot, "as the stations of the observers could not be considered as two points vibrating in space, it was necessary to reduce the ratio by half because of the influence of the ground, and hence to consider the sound transmitted by the telephone to be 1,500,000 times weaker than that directly communicated." It is well known that the intensity of two sounds is proportional to the square of the amplitude of the vibrations, and hence it may be concluded that the vibrations of the two plates of these telephones were directly proportional to the distances; that is, as 5 to 9000, or that the vibrations of the receiving telephone were 1800 times smaller than those of the transmitting telephone. They may thus be compared to molecular vibrations, for those of the receiving telephone have already a very small amplitude. From the foregoing M. Demogot argues that the telephone as a machine is far from being perfected, since it transmits but 1-1800ths of the primitive energy. Investigations looking to its improvement, he thinks, must be in one or the other of the two following directions: First by attempting to augment the vibrations of the diaphragm of the second telephone by means of electricity from a battery; second, by augmenting the useful effect of the apparatus by improving the parts so as to give more amplitude to the vibrations of the transmitting telephone. Following out these trains of thought, M. Demogot has placed, at a distance of 0.03 inch in front of the diaphragm of a telephone, one or more similar vibrating plates, in one of which was pierced an orifice of a diameter equal to that of the magnetized bar, and in the second a larger opening. By this simple means, he states, not only are the sounds transmitted augmented in clearness, but in intensity also. At the ends of a line 96 feet long, disposed between the stories of a house it was possible to converse in a very low voice. By this arrangement, the magnetic vibrating mass being greater in relation to the magnet, the electro-motive force of the currents is augmented, and, consequently, the vibration of the plates of the second telephone are also increased.

Metric Reform.

Mr. Samuel Barnett, in the May number of the *Popular Science Monthly*, brings into greater prominence some points affecting the introduction of the metric system which its ardent advocates too frequently disregard:

Among the common people the progress of the metric system has been as conspicuously slow as rapid among the nations. The statistics of its actual use, could they be had, would be heartily discouraging. In some way, and for some reason, upon the common mind it does not take hold. Indeed, in a discriminating view, its reception, even among the nations, compares unfavorably with that of many other inventions and devices of modern times: steam, railroads, telegraphy, photography, already cover the earth—all of later date than this system.

With all its admitted merits, the activity of its friends, and the co-operation of governments, the metric system makes no headway among the masses of mankind. As yet but a barren triumph has been achieved: the consent of the government, and not of the people, is the assent of the parents, but not of the maiden. Permission to woo is all we have obtained.

Even in France, although the system was provisionally established as early as 1793, and made obligatory a full generation ago, in 1840, yet the want of real progress may be seen in the following statement ("United States Dispensary," Wood and Bache, edition of 1870, p. 1737):

"Though the decimal system of weights and measures was established by law in France, it was found impossible to procure its general adoption by the people."

If they adopted new weights, they gave them the names of the old weights.

So that three systems are now more or less in use in France—the original *poids de marc*, the decimal system, and the metrical pound, with its divisions."

If such be the case in France, the birthplace of the system, what elsewhere? In the United States its use has been authorized for more than 10 years; yet how many business men in the United States avail themselves of their legal privilege? How many druggists and physicians? What merchant uses the meter? What surveyor computes in hectares? What farmer measures corn in a hectolitre? Who weighs by kilogrammes, or buys wood by the dekastere?

The words are strange and the things unknown among men of business.

It is worth while to inquire into the impediments. Among these certainly cannot be numbered the merits of any existing system of weights and measures. Take the English tables, for example; they are utterly barbarous—the whole scheme confusion worse confounded; no one defends it as it stands. But there is, nevertheless, an impediment connected with this no-system which has been a serious bar to reform—a vague hope that somehow something might possibly yet be made of it hereafter. This indefinite hope is totally fallacious. There are two tests—the decimal scale, and a proper interrelation of the tables. The English method wants both. Nor can it be altered so as to conform to either.

Addressing ourselves to the task of reform, we proceed to remark what the metric system, in substance, will do. It stands the two tests perfectly; indeed, it was made to order for that very purpose. To provide a system with a proper scale and relations was the work undertaken by science, and that work has been diligently and well done. Its merits are great and substantial; so full is it of practical utility as well as theoretical beauty, that President John Quincy Adams did not hesitate to pronounce it "a greater labor-saving machine than steam itself."

Our object, however, is not to make an argument in its favor, but to inquire into the impediments to its progress. These, though not obvious, are certainly formidable, as is shown by results. There are two sets of conditions to be fulfilled which may be distinguished as the natural and the human conditions of the problem. The difficulty is not to be found in the non-fulfillment of the former; as has already been remarked, the natural conditions have been well met by science. But after all the successful work laboriously done upon these—chiefly in the verification of the units—the hardest part of the problem yet remains, viz., such an adaptation of the system to mankind that the peoples to be benefited shall adopt and use it in the daily business of life.

Nor are men of physical science, as such, specially qualified for this task. To adapt the system to man requires a different sort of observation from the *res*, for which there are no instruments, but only the patient observation of the ways of this fastidious creature. The huge inertia of this ponderous mass of humanity, as results show, is yet to be overcome. Until this adaptation to man is complete, the problem is not solved.

What modifications of the metric system are needed to fit it for common use?

Roughly, directness and simplicity. In aiming at these we should study actual human experience. The currency system of America furnishes invaluable guidance. One of its chief lessons is, that men like not many denominations.

In our decimal currency, five denominations are proposed—mills, cents, dimes, dollars and eagles. Of these but two are practically used—dollars and cents. Had the other three been omitted, we should not have missed them.

According to the tables, a certain sum is 253 eagles, 5 dollars, 4 dimes, 6 cents, 3 mills. Never was it so called. What says our curt mankind? 2535 dollars, 46, 3-10 cents. The mind scants denominations. It seldom uses more than two if it can help itself.

Number, whole and decimal, with one unit for each subject matter, is adequate to express any quantity whatever. No second denomination is essential in any table. Any weight, for example, can be expressed in pounds and decimals of a pound without reference to other units. The largest quantities can be so expressed, and the smallest. In currency we express a national debt reaching to billions in the selfsame unit which is used for small daily transactions, say in dollars or in francs. This shows the unlimited capacity of number for exact ex-

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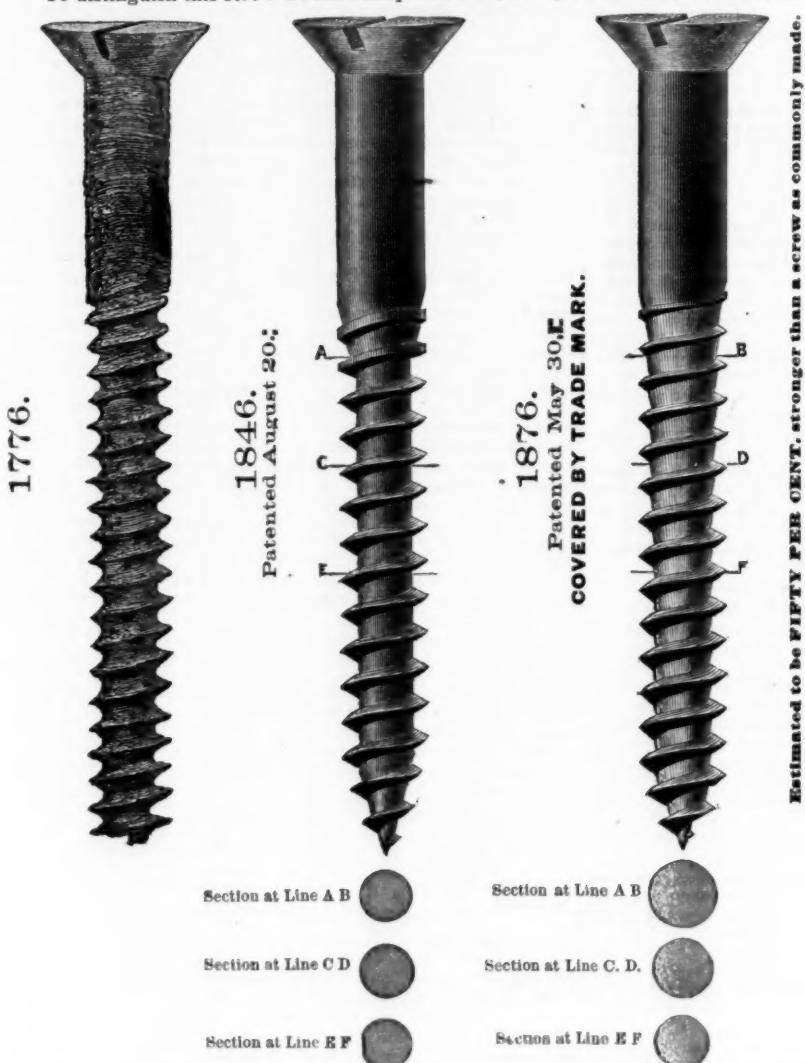


After forty years' experience we offer to the trade our Centennial Screw, patented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our machinery as fast as possible, to manufacture the improved article only. To introduce them, they will be sold at same price as the old style screw.

The new screws will be packed in manila colored boxes with new label covering end of box, and enlarged figures showing plainly contents.

To distinguish this screw we have adopted a trade mark, which is also secured to us.



The above drawings show the progress of making screw from the old blunt point to style now adopted.

Experience has shown that the weak point of screws, as formerly made, is at the heel of the thread, where all the strains of forcing the screw into the wood naturally concentrate.

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CLAIM.

"A Pointed Wood Screw having the outer periphery of the thread upon its body cylindrical, while a portion of the body below the thread and near the neck is conical, the remainder of the body to the point being cylindrical, and yet having all the thread brought to an edge of a constant angle, without jogs in the paths between the threads, substantially as described."

pression without any table of denominations at all.

Indeed, in England and America it may safely be said that a single denomination in each table would be better than the present method with its irregularity and confusion; better for mental grasp of the quantity expressed and better for calculation. A clearer idea is obtained by the expression 13,518.6 lbs. than by its equivalent in numerous denominations, 6 tons, 13 cwt., 3 qrs., 17 lbs., 11 oz., 5.6 drams.

We would not be understood to limit a system to one denomination, or even to two. Yet two well-chosen units in each table, as compared with the present English system, would be a decided improvement. Suppose we had pounds and pound cents, yards and yard cents, &c., corresponding with the dollars and cents of currency; they would furnish incomparably superior advantages to the existing methods.

We will not, however, discuss the exact denominations needed for each table, and the maximum and minimum for each; nor the scale, whether it should be strictly decimal (a denomination for every 10), or one for every 100 (the cental scale); or eclectic, varying with the subject matter. We will, however, remark that in nearly every table the number of denominations can be reduced, not only safely, but advantageously.

Our object, however, for the present is to suggest principles, not to elaborate details; too many denominations perplex, instead of aiding, the mind.

Besides the units of a system, the names are to be considered; this leads us to by far the most important subject of discussion.

Let us with this begin a lesson derived from the actual observation of human habits. The case of the French has been already cited: they adopted the new units, but rejected the new names. This is very suggestive. In the United States a similar instance occurs in the names of coins. We still have, in many parts of the country, shillings, sevenpences, thirpence, &c. In New Orleans we get bits in change. In the great commercial city of New York prices are still given, and goods marked, in shillings, viz., 6 shillings a yard, not 75 cents; ten shillings, not \$1.25. What is the lesson from all this? Plainly, that new words are harder than new things. How much easier, too, were the names of the new coins than the long and learned names of the metric nomenclature!

It were easier for the learned to acquire a nomenclature founded on Hottentot and Sanskrit, dressed off in Kamchatkan forms, than for the unlearned to acquire one in Latin and Greek with French forms; the learned have some familiarity in dealing with new languages to start with. The metric words are *ferre nature* to all people, and will not domesticate. To the common people they are simply outlandish, and neither have the accent of Christians, nor the gait of Christian, Pagan nor man."

Broadly, a system of weights and measures furnishes no case for learned nomenclature. The system is intended for wholly untechnical uses and people, while the words are adapted only to the learned, and even for them are too stiff for daily use. It is clearly a case for easy and familiar names.

More results hinge on the nomenclature than on any other feature of the system; yet it has received little real discussion; it has been simply taken for granted on its looks and outside. Indeed, it has been the boast and pet of the whole metric system, unsuspected as really the chief clog upon its progress. Brought to the tribunal of fair criticism, it is thoroughly unphilosophical, and needs to be remodeled in the light of modern investigations into the first principles of language, all of which principles it violates.

The nearer alike things are, the greater the difficulty of distinguishing them. Every one has observed how hard it is to recognize people in uniform. Upon this obvious principle the uniformity of the metric names in sound and general aspect is a serious practical hindrance.

All this is diametrically wrong. Really, one is tempted to remark that the metric nomenclature got, indeed, upon exactly the right road, but took exactly the wrong end of it. It struck out toward the hard, the learned, the abstract, instead of the easy, familiar and concrete.

The great trouble with these metric words is that they will not nick; otherwise myriameter would cast a syllable a day, and soon become short and easy. That is a way the English have. But these words will not nick at either end, head or tail. Ingenious efforts for nicking have been devised by Prof. McVicker and others which may help men of learning; but they presuppose too much familiarity already for common people.

And, after all, the true point has been missed, which is not sameness of words the world over, but merely sameness of units; the object being not to save translation, but to save calculation. Even natural units need translation, and the artificial units we devise might be content to get on a footing with natural ones. How small a purpose, indeed, would be served if the names of the measures were the same, but of the numbers not the same, nor of the things measured. Such are some, by no means all, of the incurable faults and defects of the metric nomenclature.

The obstacles to metric reform have been chiefly artificial. Like little David in Saul's armor, the system has been weighed down with superfluities. A simple illustration may be given of its highly artificial character. A sufficient table of currency would be:

100 cents make a dollar.

What would this become subjected to nomenclature? For dollar we should have to substitute some Greek word—say, *argurion* or *argur*. But give the benefit of familiarity by keeping the word dollar, the above table, metricized, would assume this form:

10 millidollars make a centidollar.
10 centidollars make a decidollar.
10 decidollars make a dollar.
10 dollars make a dekadollar.
10 dekadollars make a hectodollar.
10 hectodollars make a kilodollar.
10 kilodollars make a myriadollar.

Names.—Here comes in the process of "conscious word making," the conditions of

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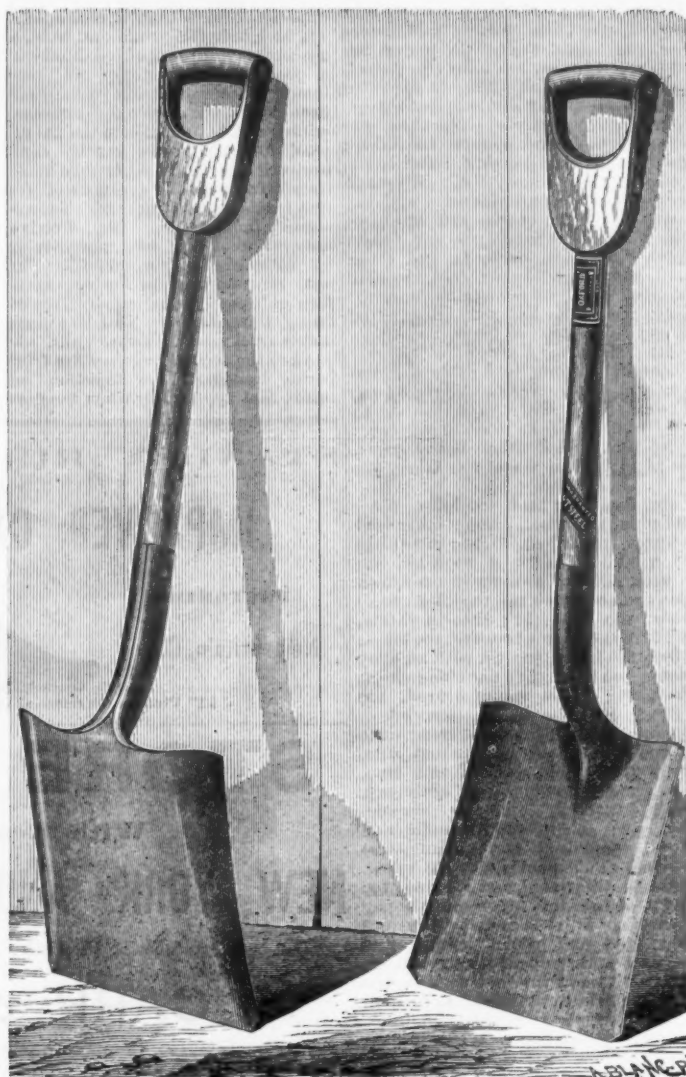
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which have only recently been much studied. The department of science which qualifies men to suggest suitable names or principles for their selection is not physical but linguistic.

The principle on which names should be given is sufficiently clear. The names should simply answer the natural questions: "How long is it? How big square? How heavy?" &c.

To illustrate by long measure—the base-unit is now called the meter—"How long is that?" is the first question. A pace, a long step, a stride, would answer the question; probably, in England and America, despite all objections, a new yard, or a long yard, is the best name. The new would be dropped in due time (as in new style and old style), and the name become simply yard.

To proceed with the table. Each and every unit in each table should have its own strong, independent name, instead of a name referring to the base-unit, so called. The actual relation between the units is important; but to express this in the name is worse than superfluous, it is a mere incumbrance. There is no danger of forgetting the decimal scale.

The metric tables provide names for—
1-1000, 1-100, 1-10, 1, 10, 100, 1000, 10,000 meters.

Some of these we would omit, and perhaps provide others not given, beginning with the 1-10,000 part, for microscopic uses.

What should the name be? It should suggest the length intended, say, a hair's-breadth, or a leaf's-thickness; soon, by shedding, a hair or leaf.

The name of the 1-1000 part? Still suggestion—say, a pin's-breadth (soon, a pin), a straw's breadth, a narrow braid, a coin's-thickness, or a card's or knife-blade's. The words "breadth" or "thickness" would serve the purpose of explanation at first, and then shed, leaving only pin, straw, braid, knife-blade, card, &c.

Some such name would serve—not, millimeter in Latin and Greek; not, even meter-thousandth in Greek and English; not, any name expressing a numerical relation to some other unit. If any numerical relation at all, not to a unit at 1000 removes. Finally, not a fractional relation, if any, but one expressed by a whole number. All these negative limitations are full of matter.

Observe that each unit thus named is as much a base-unit as any other.

Had the units of the old English system been properly related, the names were all right. Each name could stand alone! Twelve inches did not make one *duodecim* *unciae*, but one foot; three feet, not the Latin for three feet, but a terse English word, one yard (i. e., a shoot or switch—the first yard stick). Five and a half yards made (the scale being all wrong, but the name all right) one rod, pole or perch.

The following brief table might approximate to a sufficient one for linear measure:

100 hair's-breadths make 1 nail's-breadth.
100 nail's-breadths make 1 long yard.
1000 long yards make 1 mile.
Soon to dwindle to this form:
100 hairs make a nail.
100 nails make a yard.
1000 yards make a mile.

Of course, the above names are not suggested as final, but only as illustrative. Again, the actual lengths would be perfectly definite, and the modes of verifying fixed by science.

If any object to the omission of the millimeter, how easy to say ten hairs! The central scale usually suffices—witness "ten cents" vice a "dime." Ah! but how meager and shabby is this in comparison with the beautiful and learned nomenclature, with its long words, rolling *ore rotundo* from learned lips!

But how about universality? A ready means for this is found in notation. Universal symbols are as easy as a universal nomenclature is difficult. Take, for example, the nine digits. Englishmen, Frenchmen, Germans, Japanese, look at the figure 3; they call it by different names, each in his own mother-tongue, but they all think of the same thing. The thing, the thought, the mark, are all the same—the words differ. So it is with the notes in music, the symbols in algebra and geometry, &c.

A notation may be devised which addresses the eye, and is self-explanatory. The base-units may be represented, for example, as follows:

That of length, by a straight line, graduated, to distinguish it from minus.

Surface by a.....square.
Solid.....cube or block.
Capacity.....cup.
Weight.....pound weight.
Money.....coin, stamped.
Angle.....two lines, meeting.
Time.....waving line.

We only suggest, and do not expand. The substance of the foregoing suggestions, summed up, is as follows:

Adhering to the metric system as a basis—its modification by the following features:
1. The entire abandonment of the present elaborate and incensious system of nomenclature, and of any attempt at universality in the words employed to designate the units of the system.

2. The expression of each unit by each nation in its own vernacular tongue, the units themselves being the same everywhere, but the expression in language adapted to the familiar tongue of each people.

3. A common notation as a means of universality, instead of a common system of names, the units and their written expression being thus universally the same, while the spoken expression conforms to familiar national usages.

4. The words selected to express the several units to be suggestive of easy standards of comparison with familiar objects.

5. The notation also to be suggestive to the eye, as the nomenclature heretofore in use was to the learned ear, but not to the unlearned.

6. The number of denominations to be reduced in conformity with an observed tendency among men to use numbers instead; oral expression to be simplified, and a suitable actual system of notation suggested.

7. The transition of the new system to involve the least practicable loss of familiarity—either with familiar objects or familiar names.

These modifications adapt the metric system to the needful human conditions. Accepting its solutions of the natural conditions they conserve all that is really valuable, and reject only what is cumbersome. The metric nomenclature is quite as unphilosophical as the English scales; both are fit only for decent burial. The real desideratum is to reduce to a minimum the difficulty of introducing the new units. Can the transition be better effected than on the foregoing principles?

This ponderous and scattered human family—a huge class of grown pupils, not gathered into school-room, nor used to formal instruction—complains of its lessons; it begs for a less task. We propose to excuse you from your Greek and your Latin and from French forms, from long words and hard names, from the queer pronunciations and the wrong accents. We let you off from half the units, perhaps two-thirds, and furnish you with familiar standards of comparison for those which are left, and give you English names to boot—Anglo-Saxon when possible, short, terse and significant—though we take care, on our part, to have them properly related, not leaving that matter to you.

Scarcely another so important a reform awaits the human family. But it will not take care of itself. We have referred to two aspects of progress—progress among governments, want of progress among the people. The latter is incomparably the more important. The one is semblance, the other substance. Until the metric system is used, it is not a labor-saving machine for service, but a mere toy to look at—an anticipation, a dream, not a reality and a possession. And such it is now.

We must not rely on a change in human nature, but must adapt our system to it; otherwise, indeed, mankind may, perhaps, in the distant future, wear out to the system, like a Chinese foot to a shoe. Should we await this slow and painful process, or should we not rather adapt the shoe to the foot?

Can we look forward to a time when these long foreign words shall be as familiar to every child in Christendom as the words foot, yard, bushel, pound, now are to English ears? And yet this is the proper standard of familiarity; it must be absolute and unhesitating. Are they formed to be? No; we must reach the mother-tongue of each people.

Nor can we afford to wait to bring the matter home.

Can the English and American peoples—the two most commercial peoples on the globe—be content, on the one hand, with permanent isolation, founded on inferiority? or, on the other, can they ask mankind to accept their system, forsooth, as worthy of universal use? Will England, for example, ask America to return to £ s. d. and qrs.? Or America for very shame, present her compound reduction tables for the admiration and universal adoption of all nations?

Let not the friends of metric reform be deceived with vain hopes. Government work, and the work of colleges and schools and scientific associations, all put together, are not equal to adaptation!

Direct Trade With the Mediterranean.—The *Boston Journal of Commerce* says: There is considerable talk of a direct line of steamers between this port and the Mediterranean, to commence operations next winter. It is thought such a line managed in the interests of Boston would receive good encouragement. Besides green and dried fruits, the steamers could bring sumac and other Mediterranean products. Our green fruit now comes in part by the slow conveyance of Italian sailing vessels direct, and is apt to be in rather poor order. The main reliance, however, is on the Liverpool steamers, which bring here large quantities of Valencia fruit. Of course this latter fruit has been on a long journey since it left its native soil, and has undergone the expense and deterioration attending the delay and transfer at Liverpool. If brought here direct it would prove sounder and better, and ought to be afforded cheaper. The steamers of the agitated line might be chartered at first as an experiment and then a settled line be arranged for. Our fruit trade is entirely changed from what it was a number of years ago when such importers as Alpheus Hardy & Co., Baker & Morrill, Loring & Co., Homer, Sprague & Co., &c., were engaged in it. Then many of these parties had their own vessels in the business and they were swift ones. There was a large business with the West and Canada, which for one reason or another has been mainly lost here, and now we have to depend almost entirely upon New England consumption. The old Boston houses have generally gone out of the business, and new importing firms have not largely arisen to supply their places. William Worthington & Co., D. H. Tully & Co., with occasionally some of the others above mentioned mainly control this business in Boston. With speedy and direct shipments of dry and green fruits to this port, it seems as if a goodly share of the Western trade might be regained through the quality of the goods and low prices. Quite an export trade in return might also be developed from Boston, giving the steamers freight and ensuring their success.

The following extract from a private letter of recent date from a merchant at Manchester, may have interest for our readers.

Trade is as bad here as it has as yet and what could be expected when our government is acting as now? No one has an idea worth expressing of the chances of war or peace. The British youth rail at Gladstone. The conceit and pugnacity of the nation lead it into great follies. It is a mystery how sane and money-loving people can be led into such unwise and costly scrapes by a party whose past acts show that they will bully and spend, and must do so to hold together. A few years hence and we shall admit our folly, but the paper must be paid. Whether Gladstone ever recovers his popularity is a question, but I am satisfied that Beaconsfield has reached his zenith, and his descent will be a rapid one and not far distant. Undoubtedly "society" supports him now, but the middle class and the more intelligent poor, I believe, despise him.

JUST ISSUED.

HOUSE DRAINAGE AND WATER SERVICE

In Cities, Villages and Rural Neighborhoods.

WITH INCIDENTAL CONSIDERATION OF MATTERS AFFECTING THE HEALTHFULNESS OF PREMISES.

By JAMES C. BAYLES,

Editor of "The Iron Age" and "The Metal Worker."

The Publisher of *The Iron Age* has much pleasure in announcing that he is ready to receive orders for this valuable work. Its scope and practical value will be seen from an examination of the following

TABLE OF CONTENTS:

- CHAPTER I.—Hygiene in its Practical Relations to Health.
- CHAPTER II.—Sewer Gas.
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- CHAPTER X.—Sanitary Construction and Drainage of Country Houses.
- CHAPTER XI.—Water Supply and House Service in Country Districts.
- CHAPTER XII.—Suggestions Concerning the Sanitary Care of Premises.
- CHAPTER XIII.—The Plumber and His Work.

This work exactly meets a demand which has been brought prominently to the notice of the Author and Publisher by the great number of letters sent them asking if such a book could be had. Taking up the subject of the Mechanics of Hygiene where the Engineer leaves it, the Author confines his attention closely to matters of practical interest and importance to the Plumber, the Architect, the Builder and the Householder. It is an exhaustive discussion of the **Theory and Practice of Plumbing** in all departments, and presents a vast amount of useful and valuable information in a clear, concise way, so that it will be understood by all classes of readers.

The work is fully illustrated with Wood Cuts, and large folded Plates photo-engraved from working drawings, showing examples of the best plumbing practice of the time. It contains 350 pages, elegantly printed on heavy paper, octavo size, and substantially bound in cloth.

Copies will be sent postpaid to any address on receipt of the price, \$3. Address,

DAVID WILLIAMS, Publisher,

83 Reade Street, New York.

INDUSTRIAL ITEMS.

NEW HAMPSHIRE.

Eaton & Ayer, of Nashua, received an order from Scotland recently for 100,000 bobbins.

CONNECTICUT.

It is stated that the Russian government has a contract with the Waterbury Brass Company, of Waterbury, to furnish 6000 tons of metal for the making of ammunition, 2000 tons to be furnished yearly.

The steel-tired wheels of the New York Elevated Railway will be made by the Washburn Car Wheel Factory of Hartford.

The Waterbury Brass Company are paying heavier dividends than at any time during the war, and say that business is becoming quite lively.

W. G. & J. H. Morrison, manufacturers of silk and thread machinery, Willimantic, are pushed to full capacity, with orders ahead which will require three months to fill. These orders are largely from California.

MASSACHUSETTS.

Chilson's large and well-known foundries at Mansfield, employing 60 persons, reopened this week, and will be managed by the executors of the Chilson estate for the benefit of the legatees. This estate formerly belonged to Gardner Chilson, who bequeathed it all to religious societies, except the income of \$100,000, which was left to his only son. The latter proposed to contest the will and engaged Gen. Butler as counsel, but the matter was finally compromised by an additional \$100,000.

Collins Gere, of New-York, and the late firm of Hayden & Gere, has been looking over the brass works at Haydonville, and is quite sanguine that he can buy the property of the trustees at a reasonable rate. He feels sufficiently recovered in health to take the management into his hands. It is understood that Mr. Hayden has also been trying to get control of the concern through third parties.—*Springfield Republican*.

The Fitchburg Steam Engine Company, of Fitchburg, have just built a 12-inch cylinder engine and a 40-horse power steel boiler for the F. A. Whitney Carriage Company, of Leominster. They have recently shipped a 7-inch yacht engine to New York to go into the fastest 50-foot boat on the East River, a mate to the "Blackhawk," and they are about to ship an engine and marine boiler to Cairo, Ill. The company also report a good demand for the "Monarch" printing press, of which the patents are owned by New York parties, and which have a capacity of 3000 impressions per hour.

The Safe Factory at City Point, South Boston, is to be fitted up for the manufacture of patent shafting, and the Bay State Rolling Mills will be set running soon.

NEW YORK.

The Jagger Iron Company's furnace at Albany went into blast on the 29th of August, 1876, and in 21 months has lost but 3 tuyeres and made 18,000 tons of iron, of which all but 2000 tons was foundry iron. This furnace is now under the management of Mr. Davis, of Scranton, Pa., and for the past 21 months has been making an excellent foundry iron. The firm have so completely regained their reputation for good foundry iron that they have more orders on hand at present than they are able to fill.

Pratt & Co., Buffalo, are temporarily running their rolling mill double turn to catch up with orders.

For several weeks past Perry & Co., stove manufacturers, of Albany, have been receiving applications of molders and helpers to go to work when they start up their No. 2 foundry. They have decided to commence operations about June 1st. Already they have 500 applicants enrolled. From this number the superintendent will select 100 molders and 200 helpers.

The Abendroth and Root Manufacturing Co. are running their works night and day on orders. They have between 80 and 100 employees. Quite a large demand has sprung up for their spiral tubing for use in connection with the ventilating of dwellings, &c., through the late agitation of the dangers of sewer-gas poisoning. This company offer for sale their letters patent covering all foreign countries and that portion of the United States lying west of the Rocky Mountains.

NEW JERSEY.

The Glendon Iron Company of Boston, whose lease of 15 years upon the Hurd mine at Hurdton, Warren county, is about expired, have obtained from the owners a further lease of 15 years upon this valuable property. Under the old lease the royalty was 60 cents per ton, which was to be paid upon the shipment of the ore. By the terms of the new lease the royalty will be \$1 a ton, and 15,000 tons must be raised or paid for each year.

PENNSYLVANIA.

The Reading Iron Works have started up their rolling mill.

Wm. H. Stoudt, of Berks county, writes to the *Reading Eagle* from New Port, Lawrence county, that a new railroad is surveyed and partly graded from Pittsburgh to Erie and Youngstown, Ohio. Cofrode & Saylor, of Pottstown, have the contract to put up all the bridges on the whole road. The largest one is at Rochester, crossing the Ohio. A. H. Moore, foreman of the firm, has finished the bridge crossing the Stinango River at Mahoningtown. He has done the work in a satisfactory manner, and is at present employed with his force at the bridge crossing the Big Beaver at New Port. He commenced putting up the iron the latter part of last week.

The Lebanon Manufacturing Company recently shipped to parties in Philadelphia a 40 horse-power engine, heater and pump.

Messrs. Erb & Hunsicker's Maiden Creek charcoal furnace, Berks county, will be put in blast this month.

Messrs. Pott & Bro., boiler makers, at Lebanon, have received an order to build a 50 horse-power, vertical, tubular boiler for the Cape May Water Works.

Messrs. W. M. Kaufman & Co., of Sheridan, have contracted with the Lebanon Manufacturing Company for the construction of five ore cars.

Among the enterprising Philadelphia business men who have taken steps toward in-

roducing their business into Brazil are Morris, Wheeler & Co., members of the Pottstown Iron Company. Samples of iron and rails were sent several days ago in charge of two agents who will represent, besides the Pottstown Iron Company, a number of other firms.

We clip the following from the *Sharon Herald* of the 10th inst. for the week ending Saturday, May 4th: Westerman's puddle, guide and hoop mills, double turn; bar, sheet and nail-plate mill, single turn; nail factory, four days. The time set by the Western Nail Association for reducing the production expired on Saturday, May 4th, and we understand it is the intention to run the factory full time hereafter. At Kimberly, Carnes & Co.'s mill, puddle, guide and one hoop mill, double; nail factory, on all week. At the Stewart Iron Works, Furnace No. 2 has not been working as usual since the bell and hopper sunk a few weeks ago. The backing had been working out nearly all week, and Saturday night, May 4th, about 12 o'clock, the lining fell in, when they commenced shoveling it out. This has not been a very long blast in point of time, but the yield has been very great for the caliber of the stack. Stewart Iron Works Furnace No. 1 is about ready to blow in.

The Wood Bros., of Conshohocken, proprietors of the rolling mills of that place, have compromised with their puddlers. They will now receive \$3.80 per ton. The wages of all other employees of the mills have been reduced 10 per cent.

The ore and paint mines of D. B. Fisher are in full operation again, loading ore and tons of paint daily, which is shipped to Philadelphia.

PITTSBURGH AND VICINITY.

The workmen in the iron mill of Mullen & Maloney, to whom the firm were indebted when they went into bankruptcy, were paid off last week by the assignee. The sum paid out was about \$4000.

The Keystone Bridge Company, of Pittsburgh, have a large force of men erecting the superstructure of the iron truss bridge over the Monongahela River at Port Perry, to connect the Pan-Handle and the Pennsylvania roads by using the Pittsburgh, Virginia and Charleston tracks to that point. The bridge will be ready for the passage of trains in about three months.

The molders at the novelty works of the Jacobus & Nimick Manufacturing Company, at Idlewood, on the Pan-Handle Railroad, struck on Tuesday, the 7th inst., against a reduction of 10 per cent. in their wages.

Messrs. S. D. Hubbard & Co., proprietors of the Eclipse Steam Pump Works, have sold out to H. Denny McKnight, who will continue the business at the old stand.

Two hundred men who were recently discharged from the National Tube Works, McKeesport, have gone to work again.

Messrs. Lewis, Oliver & Phillips, of Pittsburgh, have leased and will put in operation the old mill of McKnight, Porter & Co., on the South Side.

WEST VIRGINIA.

The Wheeling nail mills all resumed operations on the 6th inst.

The La Belle Mill, Wheeling, with the exception of the nail factory, shut down on Thursday evening last to allow the boilers to be repaired. Messrs. Moorehead & Son, of Wheeling, are doing the work, and will have the repairs completed some time this week.

OHIO.

At the annual meeting of the stockholders of the Commonwealth Iron Co., the following officers and directors were elected for the ensuing year: President, Samuel Kimberly, of Sharon, Pa.; vice-president, Wm. E. Reis, of New Castle, Pa.; secretary and treasurer, William H. Harvey, of Cleveland. Directors—H. A. Tuttle, Samuel Kimberly, P. L. Kimberly, William E. Reis, William H. Harvey, Edward H. Harvey.

Messrs. Miller & Jamieson, of Cleveland, are now having all the work that they can do. They have lately finished a 60 horse-power boiler, largely of steel, for the new building of the Evangelical Association, on Harman street; also one of 75 horse-power for the Lake Shore Foundry; and they are building one of 50 horse-power for Stovering & Co., of Cleveland. They are also building an iron truss bridge of 75 feet span, to erected in St. Louis.

The Loomis Bridge Co., of Cincinnati, have lately taken contracts for 1180 linear feet of bridging. They have just completed a highway bridge of 140 feet span over Mill Creek, in Cincinnati.

Fritsch & Blettner, iron founders, of Cincinnati, have received orders from the Patent Ice Machine Co. of New York for a machine that will make 50 tons of ice per day. The machine is to be forwarded to House, Loomis & Co., ice dealers in St. Louis, and is to be completed in about 60 days.

There is some talk of starting up the National Glass Works of Bellaire.

The Bellaire Manufacturing Company have sold 11 thrashing machines up to May 8th. This is more than they had ever sold before up to the 1st of June. They expect to sell all the machines they make this season.

It is reported that George W. Jope and George A. Bannantine, two gentlemen well known in rolling-mill circles, have leased the Lake Shore Mill, and expect to have it in operation about the 1st of June.

All of the rolling mills at Youngstown are working up to their full capacity, the hoop mills of Cartwright, McCurdy & Co. being especially busy.

The Steubenville Furnace and Iron Co., on Monday, the 6th inst., completed the shipment of a contract for 1000 tons of iron which they had with a Pittsburgh firm. The company are shipping 15 cars of slag daily.

The Lima Machine Works, at Lima, are running on full time with a force of 50 men, and with good prospects for a season of prosperous business.

The Colwell & Collins Norway Bolt Company, of Cleveland, are in full operation with 50 men employed. Their Philadelphia carriage and tire bolts, made from pure Norway iron, are giving complete satisfaction to all consumers.

A meeting of creditors to appoint an assignee of the estate of James Ward, bankrupt, of Niles, will be held in Warren

on the 8th of June. The liabilities are more than \$1,500,000, and the assets about \$100,000.

MICHIGAN.

Nichols, Shepard & Co., of Battle Creek, have just completed the two mammoth thrashing machines for California, which will, it is estimated, thrash 100 acres of topped wheat a day.

The blast furnace of the Eureka Iron Company will soon be ready for business, but will not blow in until late in the season.

TENNESSEE.

The Chattanooga Iron Manufacturing Company, whose furnace has been out of blast more than a month for repairs, blew in last Saturday, the 11th inst. The stack has been very thoroughly repaired. The hearth and linings have been renewed with the celebrated Laclede fire-brick. A cast-iron jacket, made by the founder of the company, has been bolted round the stack, reaching from the mantle to the ground. The motive power has been carefully overhauled and placed in first-rate order. All parts of the plant have been thoroughly refitted. The furnace had made a constant run of nearly three years, and the managers are of opinion it will now hold out longer than before. The product will not go on the general market, but will be made into steel by the Roane Iron and Steel Company. The Cartersville, Georgia, gray specular ore will be used exclusively.

There will be but three furnaces in blast in the middle Tennessee district this season, and they will go to work about the 1st of June and blow out in December, unless in the meantime an unexpected improvement occurs in the iron market.

Draillard's furnace, on the Cumberland, will make about 12 tons per day. Woods and Yeatman's furnace, on the Cumberland, which is being managed by a receiver, will make about 15 tons per day. Lagrange, on the Tennessee River, will make about 16 tons per day. These are all charcoal furnaces.

Ruoh's cotton factory, steam-power, Chattanooga, is now working 50 hands on thread, yarns and coarse cotton cloths. The product is about 3000 pounds per month. A good share of the stock is bought raw in North Georgia and ginned at the factory. The woolen mill attached to the same works will be started up in a few weeks, when the manufacture of jeans will be prosecuted on a considerable scale. The full capacity of the machinery is about 5000 pounds of finished goods of various descriptions per month. The proprietor is contemplating an enlargement of his capacity.

The Tennessee Iron and Steel Works, L. Scofield, president, have been enlarged to a capacity of 10 tons per day of finished merchant bar and small rail. The works have been running double turn for several months.

GEORGIA.

Rising Fawn Furnace has been in blast since the 8th of February. In the last 20 days of February it produced 838½ tons, which classed 22¼ mottled, 241¼ close silver gray, 230 open silver gray, 227¼ No. 2 mill, 117¼ No. 1 mill. In March 1097 tons were produced, which classed 207 No. 2 mill, 400 No. 1 mill, 300 No. 2 foundry, 100 No. 1 foundry. In April 1034 tons was the product, classed as 23 tons mottled, 74 tons No. 2 mill, 70 No. 1 mill, 687 No. 2 foundry, 190 No. 1 foundry. We give the product in detail to show what can be done with a coke furnace in the Southern district when it is managed by an experienced business man. Rising Fawn is not well located by any means. It is, however, properly built, having all the modern improved appliances. It was conducted by the company which erected the plant for a time under financial difficulties and embarrassments. Since then, until last February, the property has been a foot-ball of two or three courts, being first in the hands of one litigant and then controlled by the other side of the lawsuit. Of course it made very little good iron, and that had a tendency to depreciate the capacity of the southern district to turn out a first-rate coke iron. The last turn of the legal wheel placed the furnace in the hands of Col. B. E. Wells, an experienced and prudent man of affairs, who has abundant credit and can carry any amount of product. The result is of the most encouraging character, as will be perceived by any iron man who scans the figures given above. It should be added that the ores used are the ordinary fossils found in the ridges and valleys, which is by no means as good as those which lie along the streams.

The Roane Iron and Steel Company heated up their furnace No. 1 on Monday, the 13th. The Southern States Coal, Iron and Land Company, are preparing to put the hematite and gray specular ores found on their domain in Cocke county into market.

ALABAMA.

The company operating the Eureka Coal Mine in Anderson county failed last week. This concern should not be confounded with the Eureka Iron and Coal Company which operates the Oxmoor Furnace and Eureka Mines, on the Louisville, Nashville and Great Southern Road. The latter concern we believe is quite substantial and have lately made valuable additions to their plant.

ILLINOIS.

The Centralia Iron and Nail Company will erect at Centralia this summer a nail factory with 32 machines, 3 puddling furnaces, the necessary heating furnaces, trains and other machinery for the prosecution of nail-manufacturing. Mr. S. M. Warner, the president of the company, writes us that coal can be delivered at their works for \$1 per ton.

The Warton railroad switch, through E. L. Perdriau, of Philadelphia, has been introduced into the kingdom of Sweden and placed on the Malmö Ystad Railroad for a test, and has passed through an arctic winter without accident of any kind. A report expressive of satisfaction with its working has been sent by Count Fredrik Arvidsson Posse, late Royal Swedish Commissioner to the United States, who is engaged in the construction of a coast line of railroad, running from Engelshavn to Göteborg, a distance of about 143 English miles, and it is more than probable that the Wharton switch will be used on this railroad.

Designing Machinery.

At a meeting of mechanics in Scotland, Mr. R. B. Bell delivered an address on "Designing Machinery." He noted that in early days, in designing machinery, the proportion and strength of parts to accord with the strains to which they would be subject were not so much decided by minute calculations as they were by comparison and experience. The result here was a great waste of material, placed in positions not required, as may be seen in the designs of some of our older engines and machinery. In time competition has come, and a better knowledge of the principles of design and construction, and proper calculation of the strengths and strains, and the more extensive use of malleable iron in place of cast iron, in many parts of the work, and the result has been that the framing of machinery is not now made to represent Gothic churches or Grecian temples, but every member of the machine is designed with the intention of containing only the proportion of iron due to its own requirements, disposed in such a manner as to combine all the materials in the best forms to suit the purposes intended. Attempts at architectural effect and all other unnecessary interpolations are abandoned, and the result is that in a well-designed engine or tool the eye is never offended by any unmeaning or incomprehensible member. The meaning and arrangement of every part is understood at a glance, and excites admiration by the beauty of the proportions and simplicity of the details. We quote as follows:

"In the first place, no man can design a machine in such perfection as here attempted to be described unless he has a thorough knowledge of all the principles of the machine he purposes to design, is well versed in practical geometry and mechanics, has a practical knowledge of and is able to calculate strengths, strains and forces, and to apply the calculation to apportion the quantity and form of the material in the various parts of the machine, so as to produce the greatest amount of strength with the least expenditure of material. Besides all this, he must be a good free-hand draughtsman and have cultivated an artistic taste for form and effect; otherwise, although, from possessing all the other qualifications, he may produce a machine perfect in all its working parts and properly proportioned, yet, for want of such a faculty, his machine will turn out stiff and ungraceful, and wanting in form and effect."

"It may at first sight appear absurd to say that the study of anatomy can in any way assist the mechanical engineer in designing machinery; yet, on reflection, it will be found to be a matter of no small importance. If the anatomical class and the dissecting-room are now part of the recognized studies of the artist who aims at perfection in the mere depiction of the human form, how much more should it be his study whose aim it is to produce imitations of its actions. To exemplify this, let us consider that our whole aim, in the study of mechanical appliances, is to be able to design works which will simply exaggerate the power which we possess in our own bodies, so as to concentrate the power of thousands into a unit, and to create of ourselves automata in brass and iron, to imitate the actions which are performed by the body of man himself. The human machine can dig the ground, can hammer iron, can spin, sew, weave, propel boats, lift weights, carry itself, or carry loads from place to place by land or water, can burrow deep into the bowels of the earth, and fetch water and minerals to the surface—all this can it do of itself, and has done, without the aid of machinery."

"To effect this by machinery, we, in our rude way, imitate nature as best we can, supplying the places of bones and joints, muscles and sinews, hands and feet, by shafts and rods, levers, straps and bands, wheels, cranks and connecting rods, all of which in endless combination are required for the purpose of producing what the legs and arms and hands and feet of man effect by the admirable system of natural appliances with which they are furnished, while the system of the human body in giving power and vitality to its members is copied by the steam engine and its generator; and what, after all, is the appearance of the most perfect of man's combination of machinery in comparison with the perfection of the human machine itself? Therefore the study of the human body, which in itself is the greatest perfection of a mechanical machine that it is possible to conceive, should be a part of the education of the mechanic. The beautiful mechanical arrangements with which it is furnished, the manner in which they are put together, and the forms into which they are molded, are all studies which are well worthy of the investigation of the mechanic. Let us take, for example, the arm and hand of man, so accurately proportioned in the strength of their various parts, so wonderfully shaped for the multifarious duties they have to perform, and with all its adaptation to every conceivable requirement for which their services may be demanded, yet so beautiful and graceful in their form and proportions. It cannot, therefore, be amiss in us, as a part of liberal education, to include the study of that which it is our main end to imitate, and yet which, with all our efforts, we can never equal. Then we are justified in saying that the study of anatomy is not foreign to the requirements of a cultivated mechanic. What has been said of anatomy applies equally to natural history; in fact, to everything that has life and motion."

Improvements in British Steam Colliers.—Since 1850 many changes and improvements have been made in the screw colliers, and whereas in 1850 these vessels brought about 550,000 tons of coal to London, in 1860 they brought 1,700,000 tons. The colliers now in use are larger and swifter than those of 20 years ago; hydraulic and other machinery is largely used for loading and unloading their cargoes, and time is further saved by the use of water ballast. Formerly rubble ballast was used, and when a collier had discharged her cargo a considerable time was occupied in putting ballast on board for the return voyage. On her arrival in the Tyne this ballast had to

be discharged, at the cost of much time and labor, and the huge "ballast heaps" which abound along the river banks—puzzling the visitor who strives to guess their origin—bear witness to the great savings which have resulted from the use of water ballast. Cellular tanks are formed in the bottoms of the colliers, and as soon as their cargoes are discharged they at once start on the return voyage. On the way down the Thames the ballast tanks are filled with water, and the vessel is in sea-going trim by the time she reaches the Nore. On her arrival at Tynemouth, or even sooner if the weather is favorable, the operation of pumping out the water ballast is commenced, and continued as the vessel makes her way up to the loading stage. Coal laden railway trucks there await her—her loading at once begins, and by the time this is finished the ballast tanks are free and the collier is ready to start on another trip.

Special Notices.

SPECIAL NOTICE.

The undersigned offer their services as agents to **American Producers of Metals.** They represent foreign brands of **Zinc, Russia Iron, Hoop Iron, Window Glass, Cutlery and Guns.**
LOUIS WINDMULLER & ROELKE
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Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy. A practical man with means is wanted to join a practical man who is already well established. Address **CAR WHEEL FOUNDRY,** P. O. Box 134, Selma, Alabama.

An Established House

Would like to have the agency for Spain of some American manufacturers, with the view of introducing in that country American wares. Principals only need apply to **J. M.,** No. 3984 P. O. B., New York City. Satisfactory references must be exchanged.

WANTED.—A first-class business man familiar with machinery and manufacturing, capable of handling large bodies of men, desires a responsible position. References satisfactory. Address, **IRON AND STEEL,** Care of P. O. Box 813, Bridgeport, Conn.

For Sale, To Let or Exchange

For other Property (Western preferred), Stock or Interest in an established Business,

On very reasonable terms, one of the finest pieces of property in the country for Foundry or general Manufacturing purposes, and consists of the following substantial brick buildings, situated corner Vall Ave. and North St., Troy, N. Y., viz., Moulding room, 12x24 ft., with large three-story building attached, 12x22 ft. The distance between floors and ceilings on each story is respectively 14, 12 and 10 ft., and are now used as mounting, store, sample and office rooms. Attached also is a two-story building, 22x25 ft., with engine and boiler rooms. On same grounds are sheds, barns and large yard. Attached to the property also are engine and boiler, main lines of shafting, elevators, &c. The property fronts on three streets. It will be sold, rented or exchanged, in part or together, and at very low price. Address **A. G. PATTON,** Clumbus, O.

Or W. H. HOLLISTER, JR., Troy, N. Y.

Wanted to Purchase.

A Punch for punching $\frac{3}{4}$ and $\frac{1}{2}$ wrought iron washers. **S. B. LOWE,** Chattanooga, Tenn.

Seldom Offered.

A chance to take an active interest in one of the largest and most successful steel works in this country. One strictly first-class business man to take charge of the finances, &c.; also one or two young men to assist in the general management of works, business, &c. To parties having means and ability, and who wish to engage in the manufacture of crucible and Siemens-Martin steel, no more desirable opening can be found. All communications strictly confidential.

Address, "VERITAS,"

Office of The Iron Age, 83 Reade St., N. Y.

BISSELL & WELLES, Auctioneers.

Friday, May 17, at 10½ a. m. **LARGE SALE OF HARDWARE, CUTLERY, FRENCH TINNED WARE, WOODEN WARE, &c., &c.** Also, by order of a Jobbing House retiring from business, the balance of their stock, comprising Wade & Butcher's and other make razors; Joseph Rodgers' Pocket Knives, Scissors, Carvers and Ivory Knives, English Pocket Knives; Boardman's S. P. Tea and Table Spoons and Forks, Britannia Spoons, Castors, Tea Balls, English Corkscrews; full line of richly decorated Tea Trays, and genuine Nickel Dessert and Medium Forks and Spoons; Plated Ladies and Napkin Rings, Tinned Spoons, Shears, &c., &c. Also, large lot of Scrub, Window and Shoe Brushes, A goods; nests of Painted and Cedar Traps, Pails, Brooms, Shovels and Spades, Pick Handles, &c.

To Exporters.

A middle-aged man who has been in the hardware trade for 20 years and is thoroughly posted in all kinds of goods, wants a position as purchasing agent for an export house; can bring some trade, having a large acquaintance in U. S. Colombia, South America. Address **BUYER,** Office of The Iron Age, 83 Reade St., N. Y.

The undersigned begs to inform his patrons and the public in general that he has acquired by purchase the business of Mr. R. H. TRISTED, JR., and continues the same at the old stand. He has made large additions and improvements in his establishment, and is now prepared to undertake any kind of work connected with the business of **GOLD, SILVER AND NICKEL PLATING.** Any work entrusted to him shall always have his best attention; and he guarantees perfect satisfaction. Orders sent by express or mail will be promptly and carefully attended to. Best of City references given. **P. A. WOLFF, 59 Ann St.**

Special Notices.

JENNINGS'S

COMBINATION DISCOUNT TABLES.

(Published by the author.)

This Book contains 1500 tables for single and combination discounts, such as $17\frac{1}{2}\%$, 45% , $108\frac{1}{2}\%$, $158\frac{1}{2}\%$, $258\frac{1}{2}\%$, $358\frac{1}{2}\%$, $458\frac{1}{2}\%$, $558\frac{1}{2}\%$, $658\frac{1}{2}\%$, $758\frac{1}{2}\%$, $858\frac{1}{2}\%$, $958\frac{1}{2}\%$, &c., &c., which are so arranged as to be found without loss of time, and by their use either the **Discount or Net** on any amount of dollars and cents, from a penny to one million dollars, can be ascertained in a few seconds entirely by **Addition.** Just the thing for **making, or proving invoices, finding Net Value** of goods bought or sold, and comparing different Discounts, thereby saving time, blunders and **scandals.**

(A copy can be examined in "The Iron Age" Exhibit at the Paris Exposition.)

OPINIONS.

SHEFFIELD, ENGLAND, March 22, 1878. We have tested your book and find it the most simple and perfect work possible. It will be most valuable to us in getting at NET COSTS, trying invoices, &c., and we think that every business house in the States and every house here that is at all engaged in the American trade should have a copy. We are glad to bear such testimony to its great value.

W. M. MARPLES & SONS.

POUGHKEEPSIE, N. Y., February 23, 1878. Mr. S. H. Jennings, DEAR SIR:—Enclosed please find \$1.00, for which send us by mail one copy of "Jennings's Combination Discount Tables," as noticed in The Iron Age of this week. Trusting it is what we have wanted many, many times, we are Yours respectfully, **ELSWORTH & DUDLEY.**

POUGHKEEPSIE, N. Y., April 5, 1878. Mr. S. H. Jennings, DEAR SIR:—Your "Discount Tables" came safely to hand, and the writer has tested it pretty thoroughly and very satisfactorily. Particularly do we find it useful in getting cost on goods for marking them. Trusting you may find many who will express the same opinion, we are Yours respectfully, **ELSWORTH & DUDLEY.**

It will be mailed, postpaid, to any address, on receipt of the price, \$1. Currency may be sent by mail at my risk. Address **S. H. JENNINGS,** Deep River, Conn.

S. H. JENNINGS,

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at a low rate of commission. Correspondence solicited. He has had three years' experience as Purchasing Agent for

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Jobbers doing business throughout Great Britain, and to whom he would with pleasure refer. By arrangement with them he will represent no other firm having a house or branch office in Great Britain, which includes England, Ireland, Scotland and Wales. He buys direct from **manufacturers**, and only for **export**, thus securing lowest possible prices. He is entitled to all matters this side of the water, including Purchases, Shipments, Remittances, &c., and has facilities in New York City for securing prompt shipments at most favorable rates of freight. Manufacturers of goods suitable for Foreign Trade are invited to send in their circulars or catalogues, and quote "hard pan" prices for export, which will be considered confidential.

Second-Hand Tools and Engines.

One 14 in. x 30 in. Adjustable Cut-off Engine, wheel 10 ft. diam., 20 in. face; one Horizontal Tubular Boiler, 54 in. diam. x 25 ft., has 6 tubes 3 in. diam., full front; one 22 in. Double Belt, 68 ft. long. Above in first-class order, and will be sold cheap if purchased before removal; price, \$1500. One 26 in. swing x 17½ ft. bed Engine Lathe, back geared, screw cutting, rod feed, compound rest, power cross feed, steady rest 24 in. chuck, and 3 feet rest for shafting. In first-class condition, price, \$400.

E. P. BULLARD,

Successor to BULLARD MACHINE CO., Limited,

14 Dey St., New York.

To Manufacturers of Household Hardware.

A useful machine for grating crackers, cocoanuts, &c., and slicing vegetables. Simple durable. It can be cheaply and readily made and its sale will bring large profits. The inventor and owner will sell the Patent, or make arrangements for a royalty. Address **A. F. GROEBEL,** Germantown, Philadelphia, Pa.

The Sherman Process Co.

9 Pemberton Square, Boston, Mass.,

Issue Licenses to use the Process for the

Manufacture of Iron and Steel

In the Bessemer Converter, Crucible, Siemens-Martin, Puddling, Blast and Cupola Furnaces. The use of this Process improves the quality of the product, saves fuel and labor, and does not require any change in furnace or manner of working. See page 17 of The Iron Age of Oct. 25th, 1877.

Price Book

for General Hardware. Half leather, \$10; full leather, \$12. Send for descriptive circular. In use in nearly every State in the Union, and growing in favor every day. **BUELL LAMBERSON, 97 Chambers St., N. Y.**

WANTED.—A SITUATION IN SOME HARDWARE establishment, by a young man who has been for several years connected with that trade in the West Indies. He is willing to make himself generally useful, and can furnish the best of references. Address **BAILEY,** Box 52, New York Post Office.

SPECIAL NOTICE.

The undersigned, in view of the **Paris Exhibition of 1878**, begs to inform his friends that he continues to make translations of Catalogues, Price-currents, Circulars, Correspondence, &c., from and into the

ENGLISH, FRENCH, GERMAN and **SPANISH,** and that he bestows special attention upon a strictly correct rendering of **Technical Expressions** in matters relating to **Machinery, Metallurgy, Hydraulics,** &c. The very best reference will be furnished from leading manufacturers in this city, Philadelphia and elsewhere, for whom he has translated. If desired, estimates will be procured for the setting up, electrotyping and printing of catalogues, &c., in the above languages.

G. KIRCHHOFF, Metal Reporter of The Iron Age, 83 Reade St., New York.

Special Notices.

W. GARNER,

General Merchant,

Mouldsworth, near Chester, England,

Supplies nearly every class of Goods,

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Machines,

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Solicit correspondence with American Manufacturers desirous of representation in the Australian Colonies. Consignments will have prompt attention. References furnished.

The Bullard Machine Co., "Limited,"

have retired from business. Settlement of all accounts will be made by **H. A. V. POST,** Treasurer, 23 Nassau Street, who is authorized to sign "in liquidation." Our patrons are referred to the following notice.

BULLARD MACHINE CO., Limited.

I will continue the business in Machinists' Tools, Wood-working Machinery and Steam Engines, both new and second-hand, at the old stand of the late Bullard Machine Co., Limited, No. 14 Dey St.

E. P. BULLARD.

To Manufacturers and Jobbers of Hardware, Cutlery, &c.

Manufacturers and Jobbers, having surplus stocks or goods that from any cause are unsaleable upon which they wish to realize, or assignees who have stocks to dispose of, will find a cash purchaser by communicating with **W. M. CALDWELL,** Dealer in **Job and Auction Lots of Hardware, Cutlery, &c.,** 102 Chambers St., New York.

DROP FORGINGS.

THE TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of

Iron and Steel Drop Forgings in quantities to order at reasonable rates.

HERMANN HOKER & CO., Proprietors, 101 & 103 Duane St., N. Y.

HALSEY & MILLET,

Auctioneers and Commission Merchants

112 Chambers St., New York.

Solicit from manufacturers, importers and jobbers consignments of Hardware, Cutlery, House Furnishing Goods, &c., &c., for their regular weekly sales. **JAMES E. HALSEY,** formerly of **J. E. Halsey & Co.** **CHAS. A. MILLET,** Russell, Welles & Millet.

VALUABLE CAR WORKS AT ASSIGNEES' SALE.

The Middletown Car Works, at Middletown, Pa., will be sold to the highest bidder at public sale, upon the premises, at Middletown, Pa., on the 2d day of May, 1878, at 2 o'clock. This valuable property is erected upon leasehold estate for 99 years, immediately adjoining the Pennsylvania Railroad Company, with whose tracks it is connected by sidings, and the improvements consist of a two-story brick, slate roof, machine shop, 60 by 125 feet, with commodious building shop, blacksmith shop and repair shop, with all the necessary outbuildings for an establishment of this character, and with complete machinery of the latest improved make for building cars, all in excellent working order. It is believed to be one of the best locations in the country for business of this character and the sale will be peremptory. The attention of purchasers is earnestly invited to this rare opportunity for a profitable investment, and any persons desiring to have the property will be shown it by the undersigned.

SEYMOUR RAYMOND, Assignee.

GEORGE ETTER, Assignee.

For Sale.

Large Punch and Shears, N. Y. Steam Engine Co. make; two small Punches; 16x4½ feet Planer; number of Drills and a lot of tools suitable for architectural ironwork; Steam Engines and Boilers of all sizes at **JOHN CARROLL,** 266, 268 & 270 Front St., N. Y.

TO MANUFACTURERS OF HARDWARE SPECIALTIES.

To Let, to make on Royalty, a Hardware Article (patented) of assured Sale and Profit.

This is addressed only to parties having ample resources, knowledge and prestige in the trade. For full particulars address **S. R. BARTLETT,** Concord, Mass.

Salesman Wanted,

by a **Paint Manufacturing House**, for City and Country Trade. State age, experience, references and compensation expected. No objection to those who have had only a Hardware or Drug experience. Address **Z. H. M. & CO., Box No. 6,** Office of The Iron Age, 83 Reade St., New York.

Wanted,

Agencies in General Hardware, for traveling in the Dominion of Canada. Best references when required. Address **JOSEPH BABY,** Post Office, Montreal.

Special Notices.

IN PRESS.



For June.

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SEPARATION OF ANTIMONY AND ARSENIC.

DELICATE TEST FOR VAPORS OF MERCURY.

The June number of the *Metallurgical Review* contains a large number of articles by engineers and scientists pre-eminent in their specialties, and therefore the information, the suggestions and the criticisms on topics of far-reaching importance, will command the attention of practical metallurgists and prove of direct benefit to them.

The second part of "Copper Dressing in Lake Superior," by Prof. Eggleston, gives the most detailed, accurate and discriminating description of the well-known Ball Stamp, with careful data as to the duration of its various parts, their weight and a summary of their cost. The work performed by the stamp at various mills is tabulated, thus permitting a very accurate estimation to be made of the amount of work it is able to perform. Among the illustrations are drawings of the details of the mortar which have until now been strictly withheld from the public.

The subject of Prof. W. Mattieu Williams' second contribution to the series, "Studies in Sheffield," is "Homogeneity and Annealing." The author, who is so thoroughly conversant with the important topics now agitating both engineers and metallurgists, makes some suggestions as to the means by which the great desideratum, a metal which shall combine the toughness of iron with the homogeneity of steel, may be attained.

Mr. Andrew A. Blair, chemist to the United States Board appointed to test Iron and Steel, gives a description of a method and an apparatus used by him in the "Determination of the Total Carbon in Iron and Steel." Both the method and the apparatus are the result of careful investigation, the methods used hitherto being found incapable of meeting the requirements of the Board—extreme accuracy, reasonable speed and no undue difficulty of manipulation. Chemists who are frequently called upon to make the determination of total carbon in iron and steel, will find the apparatus eminently adapted to the purpose, to which should be added that it possesses the advantage of being cheap.

The second installment of Mr. Alex. L. Holley's paper on the "Terrenoire Process of Making Solid Steel Castings," gives numerous illustrations of the practice taken from actual working charges made at Terrenoire, the exact amounts charged and time required, the nature of the tests being accurately detailed. The fact that the process has been introduced with conspicuous success in an American crucible works, proves the great importance of the subject to steel makers in this country.

Little attention has been given by American mining engineers to the intricate problems connected with the stamp mills. Some valuable information on the subject will be found in this month's installment of Mr. E. F. Altham's paper on the "Mechanical Dressing of Ores and Coal."

Copper extraction from poor ores by chlorination has been for many years one of the great industries connected with England's enormous alkali trade, poor cupriferous pyrites being roasted for the manufacture of sulphuric acid and then leached for copper. Although the process has been repeatedly described, its chemical features have never before been so clearly brought before the public as in the article now presented.

The abstract of M. Badoucau's excellent summary on the "Metallurgy of Nickel" is brought to a close in this number. Short notes on the "Manufacture of Coke from Anthracite Dust," by Jones Wister, and on the "Composition of Minnesota and Paschkoff Copper," by Dr. W. Hampe, add to our knowledge of subjects which well merit attention.

Dr. Hampe's complete analysis of Minnesota copper is the first of its kind on record, proving by analysis what users of copper have long ago ascertained, that there is no copper in the market capable of rivaling the Lake Superior brands.

brands. We hear of sales during the week of 1000 tons Thomas Gray Forge, and 1500 tons of various other brands, some of which changed hands on the basis of \$17 for No. 1. We quote Foundry No. 1, \$16.50 @ \$17.50; Foundry No. 2, \$15.50 @ \$16.50, and Gray Forge, \$14.50 @ \$15.50.

Scotch Pig.—The demand is light, and our quotations, although unchanged, are, in the present condition of the trade, only nominal. Sales are reported since our last of 200 tons Glengarnock and 100 tons various other brands in lots, all on private terms. Of arrivals we hear of 500 tons (part for export), and 200 tons Coltness and Eglinton. We quote Glengarnock, \$24.25; Eglinton, \$23.50, and Coltness, \$24.

Rails.—Sales are reported of 4000 tons Steel Rails, full delivery, on private terms. In iron nothing is reported, and we quote as before: Steel at mill, \$43 @ \$44, and Iron, according to quality, terms of payment, &c., \$32 @ \$36.

Old Rails.—Some transactions in Old Rails have occurred during the week, but the particulars are withheld. We quote the market \$18 here.

Scrap.—A sale of 500 tons Scrap on private terms is reported. We quote No. 1 Wrought from yard, \$21 @ \$22 nominally.

METALS.

Copper.—Since the sales previously advised, the market has relaxed into a state of great dullness. The amounts which changed hands during the week do not all told exceed 100,000 pounds Lake Superior at 16½¢; the same figures asked at the close, but there are no buyers. Baltimore Copper is quoted 16½¢ @ 16¾¢. We learn by cable from England that Best Selected gave way \$1, selling at \$68.10, and that Chili Bars simultaneously declined 10¢, closing at \$61.10. By mail, under date 1st inst., we received from the same quarter the following: "The market is quiet, with an improved inquiry for Yellow Metal Bolts. Manufactured is very dull and neglected. We quote Chili Bars, \$62 @ \$63; Tough Ingot, \$68 @ \$70, and Bolts and Sheets, \$73 @ \$74; Yellow Metal Sheets, 6½¢ @ 6¼¢, and Bottoms, 6¼¢ @ 6½¢." There is a moderate demand for Manufactured Copper and Yellow Metal at the combination prices, which are unchanged. English Yellow Sheathing Metal is in limited request, but prices are steady at our former quotation of 14½¢. We quote: New Sheathing Copper, 26¢; Braziers, 28¢; and Bolts, 28¢; American Yellow Sheathing Metal, 20¢; Yellow Metal Bolts, 25¢, and English Yellow Sheathing Metal, 14½¢ @ 15¢, currency, in bond.

Tin.—Our market remains steady at 14½¢ @ 14¾¢, gold, for Straits; English Refined, 14½¢; Lamb and Flag, 14¢ @ 14½¢, and Banca, 17¢ @ 17½¢, all gold, large lines. About 400 slabs Straits Tin were sold during the week at 14½¢, gold, and a few smaller lots at 14¾¢, gold. There arrived during the week some 6000 slabs Straits. The markets abroad show little change; London cabling, \$61; Singapore, \$18.25 @ picul, and Penang, \$17.62½ @ picul. Tin Plates.

—We have received the following from Liverpool, dated 1st inst.: "There is at length some assurance that prices have touched their lowest. At a general meeting of the manufacturers, held at Swansea eight days ago, at which 144 mills were represented, it was unanimously resolved that, if 20 more mills (making three-fourths of those now working) could be induced to join, an effort would again be made to check further decline, and, if possible, improve prices by a reduction of one-third in the present production. That the extra 20 mills will be found is, we believe, almost certain, for makers, in common with the trade generally, must gladly welcome any scheme calculated to put an end to the ruinous figures which have been ruling, and we are in hourly expectation of advice that the resolution has been put into force. Former efforts at reduction having failed, there is, not unnaturally, a certain disbelief in the present movement, but if the resolutions as proposed be carried out, which will take about 25,000 boxes per week off the market for three months, we think there can be little doubt of the result. The prospective effect is already being felt, and many makers decline business except at advanced prices; but we hardly think this is warranted, for it will take time to work down accumulated stocks and convince the trade that makers are at last in earnest." This is taking a very reasonable view of the whole affair. The market here is moderately active. We quote, gold, per box, large lots, ordinary brands, as follows: Charcoal Bright, \$5.87½ @ \$6.12½; ditto Termes, \$5.37½ @ \$5.50; Coke Tin, \$4.90 @ \$5.10, and ditto Termes, \$4.87½, all gold.

Lead.—Since our last report the market has been flat, and nothing in the way of sales has transpired. We quote Common Domestic nominally 3½¢, currency. From England we have the following by mail, dated May 1: "Lead is quiet, with little inquiry for export, but a moderately fair demand for home trade. We quote English Fig, \$17 @ \$17.5; Sheets, \$18.10, and Pipe, \$19." For Manufactured there is a fair demand at steady prices. We quote: Bar, 6¢; Pipe, 6¢; Sheet, 6¢, and Tin-lined Pipe, 15¢, all less 10% to the trade.

Spelter and Zinc.—Common Domestic Spelter has come to a complete standstill here, and we quote the same, nominally, 5¢ @ 5¼¢, currency, according to quantity and brand. The metal has become somewhat steadier in Europe. In England, Original is worth \$19, and Hard, \$15.10, while Sheet Zinc commands \$23 @ \$23.10. The market for Sheet is dull, and prices are to a great extent nominal. We quote Mosseman, 7½¢ @ 7¾¢, gold, and Domestic, 6½¢ @ 6¾¢, currency.

Nickel.—Remains quiet and unaltered at \$1.30, currency.

Antimony.—Is quoted in the English reports just received, bearing date May 1st, \$49 @ \$50. The demand here is restricted just at present. Cookson has sold in a mod-

erate way at 12¼¢, gold, while Hallet would, we presume, be sold at 12¼¢, gold.

EXPORTS.

Of Hardware, Iron, Machinery, Metals, &c., from the Port of New York, for the week ending May 14, 1878.

Quan. Value.	Quan. Value.
Hdw., cs., 50	\$250
Hamburg.	
Copper, cks., 118	24,500
Ag. imp., pkgs. 349	8,162
Pumps, cs., 3	88
Mach'y, cs., 39	2,923
Sew. mach., cs., 8	120
Belting, cs., 4	1,005
Cop'r ore, bbls. 18	1,000
Hdw., cs., 70	2,105
Guns, cs., 1	180
C'ge mtl., pgs., 23	693
Mf. iron, pkgs., 3	100
P't'd ware, cs., 3	1,454
Bremen.	
Hdw., cs., 68	1,388
Mach'y, cs., 1	143
Cop. mtl., sks. 35	3,400
Ag. imp., pkgs. 649	6,855
Cutlery, cs., 1	75
Belting, cs., 3	650
Mf. iron, pkgs. 53	3,140
Antwerp.	
Ag. imp., pkgs. 5	390
P't'd ware, cs., 3	151
Hdw., cs., 4	230
London.	
C'ge mtl., pgs. 7	750
Hdw., cs., 32	168
Sp'g beds, pgs. 19	1,500
Bristol.	
S'd'p'r, bbls. 21	167
Hull.	
Pumps, pkgs., 3	45
Ag. imp., pkgs. 293	6,514
Mach'y, cs., 4	3,375
Hdw., cs., 88	1,849
Car wheels, 380	2,700
Liverpool.	
Mach'y, cs., 56	8,703
Iron safe, 1	300
Pumps, pkgs., 4	237
Tinware, cs., 3	200
Hdw., cs., 141	6,107
Ag. imp., pkgs. 229	10,151
Mf. iron, pkgs. 16	2,000
Glasgow.	
Ag. imp., pkgs. 62	1,340
Mach'y, cs., 24	1,921
Lea. bell, cs., 3	2,870
Hdw., cs., 2	50
Sad iron, cks. 15	450
Iron rolls, cs., 4	240
French West Indies.	
L'g. rods, bxs. 2	75
Plat'd wire, cs. 1	50
Brazil.	
Cutlery, cs., 175	3,064
Nails, cs., 39	116
Hdw., cs., 29	459
Ag. imp., pkgs. 6	33
Wheels, setts., 2	373
Mach'y, cs., 19	1,490
Peru.	
Hdw., cs., 9	160
Cuba.	
Hdw., cs., 128	4,603
Nails, kegs., 349	907
Cutlery, pkgs., 4	247
Gas fixt., cs., 7	273
Car wheels, 24	84
Grindstones, 140	80
Copper, cs., 2	117
Mf. iron, pkgs. 381	2,200
Coal, tons, 905	3,247
Refrigerators, 7	109
Sew. mach., cs. 224	1,684
Mach'y, pkgs. 82	8,966
Nails, cs., 31	105
R. R. mtl., pgs. 655	3,215
Pumps, pkgs., 2	110
Iron, pkgs., 138	1,106
United States of Columbia.	
Guns, cs., 59	17,750
Mf. iron, pkgs. 10	107
Tel. mtl., pgs. 2	266
Ag. imp., pkgs. 4	175

Of Hardware, Iron, Steel and Metals into the Port of New York, for the week ending May 14, 1878:

Hardware.	Sawer John, 1
	Zuberia Ingo & Co., 1
	Ore, tons, 233
Order.	
	Wire rope, 27
	Sheet, bbls., 54
	Plates, 12
Steel.	
	Frasse P. A. & Co., 2
	Prosser Thomas & Son, 1
	Middleton & Co., 68
	Saxton & Seabury, 2
	Cases, 14
	Woodford W. O., 1
	Bundles, 66
	Cases, 26
Order.	
	Bundles, 281
	Cases, 7
	Casks, 31
	Bars, 38
Metals.	
	Bortchmann J., 1
	Tin, slabs, 374
	Byrne Joseph C., 1
	Tin plates, bxs., 465
	Brown Bros. & Co., 1
	Tin, ingots, 240
	Cort N. L. & Co., 1
	Tin plates, bxs., 224
	Darrell & Co., 1
	Metal, kegs., 1
	Hopkins E. T., 1
	Tin plates bxs., 465
	Lamarche H., 1
	Roll'd zinc, cks., 50
	Naylor & Co., 1
	Tin plates, bxs., 1300
	Pratt Chas. & Co., 1
	Tin plates, 830
	Phelps Dodge & Co., 1
	Tin plates, bxs., 2483
	BFK & Co., 100
	Schneider J. & Co., 1
	Tin plates, bxs., 380
Order.	
	Tin ingots, 360
	Tin and steel plates, 288
	Tin plates, bxs., 679
	Tin, slabs, 5716

COAL.

The usual reports of dullness of trade continue to come in. Some kinds of Coal, however, are scarce, and prices are reported up to or above circular quotations. Some retail dealers here seem to think that the combination is an established fact, and that there is no chance for a break. They formed these opinions on the absolute necessity for the companies to hold themselves together, a necessity to which the companies seem to be fully alive. Nothing could, under the present circumstances, be more demoralizing and disastrous than a break at the present moment. The real question seems to be that of running prices up to a point where, with the reduced consumption, the returns will be large enough to

float the companies. There is a rumor of a 25¢ advance for June. Altogether, the combination and its friends seem hopeful. It would seem, however, that there are some influences at work which are not altogether desirable, and it may be found that causes of disagreement will arise from them later in the season which will become serious.

OLD METALS, PAPER STOCK, &c.

There is still nothing doing in the market for Old Metals, Rags, Paper Stock and other junk materials. Trade is without any activity. The demand is very light and stocks are abundant. Prices of all grades of Old Iron have declined from 50¢ to \$1 per ton. Copper and Zinc have also fallen ½¢ per lb. The purchasing prices offered by dealers for Old Metals are as follows:

Copper, heavy, per lb.	\$0.10½ @
Copper Bottoms, "	10½ @
Yellow Metal, "	10 @
Brass, heavy, "	10½ @
Brass, light, "	10 @
Composition, heavy, "	11½ @
Lead, solid, "	10½ @
Tea Lead, "	10½ @
Zinc, "	10½ @
Pewter, No. 1, "	10 @
Pewter, No. 2, "	10 @
Nails, kegs., pr. ton.	\$16.00 @
Light do., "	16.00 @
Stove Plate, "	16.00 @
Machinery do., "	16.00 @
Grate Bars, "	16.00 @

The prices current for Rags, &c., are as follows:

Canvas, Linen, per lb.	3 c. @ 3½¢
Cotton, No. 1, "	5 c. @
" No. 2, "	5 c. @
White, No. 1, "	4½¢ @
" No. 2, "	4½¢ @
Seconds, "	2 c. @
Mixed, Woolen, "	2 c. @
Soft, do., "	1½¢ @ 2 c.
Gunny bagging, "	3 c. @
Butte, "	3 c. @
Kentucky bagging, "	3 c. @
Book Stock, "	1½¢ @
Newspaper Stock, "	1½¢ @ 1½¢
Waste Paper and Scraps, "	1½¢ @
Kentucky Bale Rope, "	4 c. @
Oakum Junk, No. 1, "	4½¢ @ 5 c.
" No. 2, "	3 c. @
Tarred Shaking, "	1 c. @
Grass Rope, "	1 c. @

PHILADELPHIA.

Office of The Iron Age, 220 South Fourth St., PHILADELPHIA, May 14, 1878.

Pig Iron.—There is no change to note in the general condition of the market, although there is perhaps in some directions a little less pressure to realize. Sellers are still anxious to find a market for their products, but it is found that cutting prices does not increase business to any appreciable extent, so that unless under great financial pressure, sellers are more disposed to wait inquiries from buyers rather than force their goods upon them. With this exception, we cannot report any improvement in the condition of the market, and business shows no more activity than heretofore. Consumption of Pig Metal in nearly all the leading branches is very limited, and as there is no demand beyond what is required for immediate use, the feeling is dull and despondent. Under these circumstances there is a wide range of prices, according to brand, requirements of buyers and necessities of sellers. Well-known brands which have been in constant use by leading consumers, and which have become in some degree a necessity, command full market rates, while others, which are claimed to be of equal quality, but less known to consumers, cannot be placed unless at comparatively low prices. In view of these facts it need cause no surprise to hear of offerings and occasional sales at considerably less figures than are generally quoted. We might report actual transactions of this class, but as each one to be fairly given as market quotation would require specific details to be properly understood. We give average quotations, which are about as follows: No. 1 Foundry, \$18 @ \$19; No. 2, do., \$17 @ \$17.50; Gray Forge, \$16 @ \$17; Mottled, \$15 @ \$15.50.

Ores.—Magnetic Iron Ores are quoted at \$2.50, f. o. b. at Hacklebarney mines, for "Blue" Ore, hand broken and selected. "Red" Ore, price \$2.75 f. o. b., cars.

Blooms.—The market is dull and weak, and sales cannot be made to any extent unless at some concessions from our quotations. We note several transactions at about \$1 to \$2 below quoted rates, which may be considered almost nominal. We quote: Sunken Scrap Blooms (246 lb.), \$42 @ \$45; Northern Ore Blooms (224 lb.) \$37 @ \$39; best quality Charcoal Billets (224 lb.) for, wire and steel purposes, \$50 @ \$55; Bars do, \$65 @ \$67.50; Sheet Iron Blooms, cornered (246 lb.) \$58 @ \$60; Cold-blast Charcoal Plate Blooms, \$53 @ \$55; run-out Anthracite, \$50 @ \$52.50.

Muck Bar.—There is no demand, and no sales have been reported for some time past. Sellers ask equal to \$30 or \$33, Philadelphia delivery, according to quality.

Plate and Tank Iron.—Business in this department has been more active during the past few days, and with several inquiries for important lots the outlook is somewhat more encouraging. A number of orders for small lots have been placed during the week, and for the time being the mills are fairly employed. There is not sufficient doing, however, to stiffen up prices, which continue weak and irregular at about former quotations, viz.: Common Plates, 2.2¢ @ 2.3¢; Tank Iron, 2.3¢ @ 2.5¢; C. No. 1, 2.4¢ @ 2.6¢; Shell Iron, 2.75¢ @ 2.9¢; Flange Iron, 3.75¢ @ 4¢; Solid Firebox, 4.85¢ @ 5¢; and Best Bloom, 5.5¢ @ 6¢.

Sheet Iron.—There is a little more business doing, but no lots of any size have changed hands. Prices continue weak and drooping, and buyers seem unwilling to buy beyond what is required for supplying immediate wants. We quote: Refined Sheet Iron, No. 25 to 28, 3.4¢ @ 3.5¢; No. 22 to 24, 3.3¢ @ 3.4¢; No. 16 to 21, 3.2¢; Best Bloom Sheets, No. 25 to 28, 5.2¢ @ 5.4¢; No. 22 to 24, 5¢; No. 16 to 21, 4.7¢ @ 4.8¢; Common Red Plates, 5.1¢ to 18, 2.4¢ @ 2.5¢; Refined Plates or Blue Annealed, 5.1¢ to 18, 2.5¢ @ 2.6¢; American, R. G., 5.1¢ to 18, 3¢ @ 3.1¢; Best Bloom, 5.1¢ to 18, 4.9¢ @ 5¢; Philadelphia Russia, 6¢ @ 6.5¢; A. Patent Planished, 10½¢; B. Patent Planished, 9½¢; Bloom Galvanized, 40¢; Refined Galvanized, 50¢.

Bar Iron.—Business continues dull and the market is without change since date of

our last report. Consumption is exceedingly limited and the offerings largely in excess of requirements. Prices are unchanged, however, and it is well understood that further reduction is quite impossible unless quality is made to suffer in proportion. The outlook at present is most discouraging, and all hopes of an early improvement seem to have vanished. Low prices evidently do not bring business, as the mills making Iron at the lowest quotations find no more demand than those running on the highest qualities. We quote: Best Refined, 2¢; Medium, 1.75¢ @ 1.85¢; and Common, 1.5¢ @ 1.6¢.

Structural Iron.—The mills engaged in this branch of the Iron trade are all fairly employed, with prospects of a satisfactory summer's business. We cannot report any new contracts closed since last week, but there are some important matters pending, which will no doubt result in large orders in course of the month. We continue last week's quotations as follows: Angles, 2.25¢ @ 2.50¢; Tees, 2.50¢; Beams, 2.7¢ @ 2.8¢; Channels, 2.7¢ @ 2.8¢.

Steel Rails.—The market is somewhat easier than it was a week ago, and we hear of sales at slightly lower prices. This is no doubt due to the fact that buyers find it impossible to place their orders for immediate delivery unless at high figures, while for fall delivery there is a disposition to enter orders at slightly lower rates. The mills have nearly as many orders as they can attend to during the summer months, consequently they are not in a position to undertake further business, unless the deliveries are made to suit their convenience. Where this can be done, buyers obtain concessions, and in fact, sellers manifest some little anxiety in the matter, and by naming high figures for prompt deliveries, hope to obtain contracts by reducing figures on late deliveries. Upon this basis sales have been made at something under \$43 at mills, while other sales have been at \$43.50 @ \$45 at mills for summer delivery.

Iron Rails.—Sales during the week have not been important, although a few good small lots have changed hands. The mills are generally well employed, and there are buyers in the market sufficient to warrant the expectation of continued activity for some time to come. The demand is not confined to any particular location, but appears to be general, and for the time being the market looks quite healthy. The prospect of abundant crops, as well as the increased earnings of most of the roads since the commencement of the year, appears to warrant favorable anticipations, and it is not unlikely that the present activity is something more than a "spurt," and may lead to a permanent improvement in the Rail trade. We continue our late quotations, say \$32 @ \$34.50 at mills, according to section, quality and terms of payment.

Old Rails.—The dullness noted in our last report still continues, and in one or two instances sales have been made at prices considerably lower than quotations. The demand for the present is pretty well supplied, and in case of lots placed on the market for immediate sale, heavy concessions have to be made to secure a buyer. Good qualities, however, are scarce, and as a rule holders are firm and prefer waiting for a demand sooner than force them on the market at a sacrifice. Prices cover a wide range, say from \$18.50 @ \$20, with sales at both limits, and at which figures we quote the market quiet and unsettled.

Scrap Iron.—The offerings are light and sales are made without difficulty within the range of our quotations, price according to selection, say, Wrought, \$21 @ \$23; Cast, \$14.50 @ \$16.

Nails.—The demand is inactive, and it is said that buyers of large lots have been able to obtain some concessions, although \$2.50 is understood to be the wholesale price. Messrs. James Rowland & Co., of this city, have just commenced the manufacture of Nails, and are in a position to fill all orders promptly and satisfactorily.

Lead.—The market is dull and inactive, with Common Domestic quoted at 3½¢. Manufactured is steady at 5½¢ for Bar, 6¢ for Pipe, and 6½¢ for Sheet. Shot is moderately active as follows: Chilled, 9¢ @ 10¢; Drop, 7½¢ @ 8½¢; Buck, 8½¢ @ 9½¢, all less the regular trade discount of 10%.

PITTSBURGH.

Office of The Iron Age, 77 Fourth Avenue, PITTSBURGH, May 14, 1878.

There has been nothing particularly new developed the past week; general business continues unsettled and very unsatisfactory, but with little prospect of any immediate improvement. The prospective repeal of the bankrupt law has weakened confidence, and it is not to be wondered at in view of the numerous cases of bankruptcies throughout the country within the past few weeks. The number of people "embarrassed" recently has increased wonderfully, the bankrupt courts are pressed with business, and the lawyers are reaping a golden harvest. Times have changed greatly. Men who a few short years ago were thought to be as solid as a gold mine, have, as the saying is, become "embarrassed," and it is discovered upon investigation that they never had anything; that their assets consist of worthless book accounts and real estate mortgaged for a good deal more than it can be sold for, and the creditors get little or nothing. This being the case, it is not surprising that business, in all its varied branches, is very unsettled and exceedingly unsatisfactory throughout the whole country, and until confidence has become somewhat restored it will continue so. There is scarcely a manufacturer or merchant who could not largely increase his sales if he were to sell on time, as in former years before the panic, but this he is refusing to do, preferring less business to taking the paper of those who are at all doubtful, and herein lies the great cause of the present stagnation and derangement. Stocks of all kinds of manufactured goods, both in hands of jobbers and consumers, are comparatively light, and there is a demand for them, but, owing to the want of confidence, only those of undoubted standing can buy on credit, all others are required to pay cash upon delivery.

In regard to the bankrupt law, no one can

gainsay its main object, to assist the unfortunate and give them a fresh start in the world; but there are so many rascals taking advantage of the present law that it ought, if such a thing is possible, be so changed as to put a stop to this rascality which threatens to ruin the country. It is by no means uncommon for people nowadays to convert everything they can into cash, then convey all their property worth anything to their relatives or friends before going into bankruptcy, and by the time the costs of the court are paid there is nothing left for the creditors, while the bankrupt comes out in the sight of the law free; whereas, in fact, he ought to be in the penitentiary. Such proceedings have become so common of late that every man going into bankruptcy is looked upon with suspicion, and honest and deserving men, ruined possibly by the rascality of those whom they have befriended, are placed in the same category by the general public with the dishonest.

Pig Iron.—The market remains in much the same condition noted in our last report; business continues exceedingly dull, the inquiry is still of a hand-to-mouth character, and the situation, so far as the producing interest is concerned, is more discouraging now than it has been at any time yet. It was very generally expected that there would be an increased consumption in April and May, but these expectations have not been realized. On the contrary, there was more business in March than April, and May does not promise to be any better than April. Consumers, while conceding that the raw article is very low, and affords no margin for profit to the producer, aver that it is higher relatively than the product, and some of them expect to be able to buy at still lower rates than those now current. Prices continue weak, but without quotable change as compared with last week. Bituminous Coal-uncleaned, \$17 @ \$19, 4 months, for neutral to best brands of open Gray Red-short; Forge, and Foundry, \$19 @ \$21; but very few sales of Forge recently above \$18 @ \$18.50. Coke Irons, \$16 @ \$17, 4 months, for Forge. Hanging Charcoals, \$20 @ \$23, 4 months, for Mill, and \$23 @ \$26 for No. 2 and Foundry; Cold-blast, \$35 @ \$38, the former for "Vesuvius" and the latter for "Hecla." Sales of Eastern Cold-blast at \$27, cash. Bessemer is still quotable at \$19.50 @ \$20, 4 months.

Manufactured Iron.—There has been no essential change in the position of the market during the past week. While some manufacturers report that they have but few orders for the season, others are reported all they can fill; but on one very important point all agree, namely, that prices are very unsatisfactory, and under the most favorable circumstances afford little or no margin for profit. Here in Pittsburgh there has been a very fair volume of business this spring, which was stimulated, no doubt, by the very low river freights, enabling her to compete successfully with other points; but if manufacturers are to be believed, they have made no money. Not only are prices very low, but they are very irregular. There is no concerted action in this important particular, and as cheapness appears to be sought after more than quality, those mills giving the lowest rates are getting the most of the business. For anything of good stock prices may be quoted upon a basis of 1.65¢ @ 1.75¢, 60 days, 2¢ off for cash, for Merchant Bars. Your correspondent was assured yesterday by one of our most prominent firms that they had an offer from the East to buy largely at 1.60¢ rates, which they refused to accept; and some of our manufacturers are holding at 1.80¢ rates to large and 1.90¢ to small buyers, but the most of the business is within the range of 1.65¢ @ 1.75¢.

Nails.—At the meeting of the Western Association last week it was agreed, in view of the fact that many firms have no stock and are unable to fill their orders, to leave the matter of production open until the next regular meeting, 12th of June; in other words, manufacturers are at liberty during the time in question to run full or half time or stop altogether, just as they please. Owing to a strong local competition among jobbers, manufacturers have been forced to yield in price, and sales are now being made at \$2.30, 60 days, 2¢ off for cash, although the card remains unchanged at \$2.50 with a rebate of 10¢ on orders for 200 kegs and upward.

Horse and Mule Shoes.—There is a fair business for the season, but no change in prices; Juniata brand still quoted in 100-keg lots at 3¼¢ and 4¼¢ per lb.

Window Glass.—Orders are not coming forward as freely as last month, and it is probable the demand will be light until the fall trade sets in. No change in prices, which to manufacturers have been unremunerative all this year. We continue to quote discounts at 70 and 10 to 75, straight.

Coke.—There is no abatement in the demand, which, notwithstanding the depression in Pig Iron, is greater than ever before. Dealers report that there is no difficulty in selling, which may be attributed to the low price increasing the consumption. The demand on Eastern account has increased largely, and shipments, both East and West, are large. We continue to quote at \$2.15 @ \$2.17 per ton, delivered free on cars in Pittsburgh.

Coal.—The shipments from this point by river on the recent water foot up in round numbers about 11,000,000 bushels, and while the stock here is almost exhausted, operations at the mines having been generally suspended last month, the supply in the down-river markets has been largely increased. Price for good lump, delivered free on cars here, 4½¢; demand light.

CHATTANOOGA.

Office of The Iron Age, Market and 8th Sts., CHATTANOOGA, May 14, 1878.
Business shows a slight improvement on the previous week. Low water having delayed the river trade from upper waters, a large share of it came down on the rise caused by rains from the first to the fifth. About 100,000 bushels of grain, a good deal of bacon and other farm products got in since Monday, which has given a decided impetus to trade. In the iron business there is nothing new to report. Prices are maintained at last quotations, and are not likely to go any lower. What few furnaces continue in blast do so because they have thoroughly learned the lesson of economy, and are able, even at very low rates, to realize a small profit, or at least to suffer no losses. Bar Iron is rather better than last week. Nails have weakened here in consequence of the slashing of rates by Ohio river mills. They continue to sell at \$2.15 in the Memphis and Louisville markets, which will net the mills barely \$2. Either this sort of business must cease soon or the mills run on such a schedule must close up. So far the price has held up here very well, probably because our mills make a decidedly superior article. Bolts, spikes—all railroad supplies, are in good demand at quotations. The weather during the first days of the week was rainy, which has changed to very fine cool days.

Pig Iron.—The trade has been fair, the demand sustaining the last quotations. The supply is full. We quote: Coke Irons—No. 1 Foundry, \$17 @ \$18; No. 2, \$15 @ \$16; Gray Forge, \$13 @ \$14; White and Mottled, \$11 @ \$12. Hot Blast Charcoal—No. 1 Foundry, extra, \$20 @ \$21; do., \$18 @ \$20; No. 2 Foundry, \$16 @ \$18; Gray Forge, \$15 @ \$17; White and Mottled, \$15. Cold Blast Charcoal—Car Wheel Metal, \$22.50 @ \$27.50; do., Extra Standard, \$24.50 @ \$29.50; Forge, \$17.60 @ \$22.

Muck Bar.—\$27 @ \$34: Old Rails, \$16.50 @ \$17.50. Old Car Wheels, \$18.

Ores.—Brown Hematite, 50 to 56%; ½ ton, \$1.75 @ \$2.25. Red Fossiliferous, 50 to 56%; ½ ton, \$1.70 @ \$1.90. The above prices for Ores delivered in Chattanooga on cars or on the wharf from flat-boats.

Nails.—We quote at \$2.40, with usual discount in large lots.

Manufactured Iron.—The demand for Bar is rather better than it has been and prices are firm. Mills are all running full time. Bolts, Spikes, Fish Plate, &c., are in brisk demand. Bar we quote at \$2. We quote: Railroad Spikes, \$2.50; Light Rail, \$2.25; Track Bolts, \$3; Trestle Bolts, \$4.

Iron Rails.—The mill here is engaged on some considerable jobs of re-rolling. There is no demand for new Iron Rails, and any quotation of them would be merely nominal, and therefore of no value.

Coke.—No change. Supply ample and quotable at usual price, \$2.50 per ton on cars in Chattanooga.

Coal.—Is in light demand, and the supply being unusually full, prices tend downward. Chattanooga is next to Pittsburgh in the cheapness of fuel for manufacturing purposes. We quote run of mine at \$1.50 @ \$2 per ton on cars in Chattanooga.

CLEVELAND.

CLEVELAND, May 14, 1878.

Ore Iron.—The business in Lake Superior Iron remains in about the same state as last noted. There is nothing of consequence being done. But few sales have been made for the past month. Notwithstanding the absence of business and the evident disinclination of the furnaces to buy, the Ore companies are firmly maintaining their ground and holding prices up. The sales made are for very limited quantity, and mostly for immediate delivery.

Pig Iron.—There is less business in Pig Iron than during the month of April. Orders are only for limited amounts and usually at buyers' figures. Nearly 2000 tons of poor quality metal is reported sold here at less than \$15 a ton. Charcoal Iron is in good demand, but at no improvement in prices.

Bar Iron and Nails.—The mills are not so busy, and jobbers find less activity than in the early spring. There is still, however, some inquiry for good iron at better prices than prevailed earlier.

Scrap Iron.—There is a good business doing in Old Rails. Prices are firm, and holders insist upon cash payments at \$20 @ \$22, according to quality and delivery. Other kinds of Scrap are active, with an upward tendency for No. 1 Wrought and good Cast.

BOSTON.

MAY 14.—Pig is dull and easy, and prices still decidedly favor the buyer. We quote \$20.50 @ \$21 for No. 1, \$19 @ \$19.50 for No. 2, and \$18.50 @ \$19.25 for Gray Forge. Bar continues quiet and steady, quoting \$40 for Refined and \$34 @ \$35 for Bolt; American Rails, \$32 @ \$37; Steel Rails, \$42 @ \$43, from mill. Nails are in light demand at unchanged prices. Sheet

is selling at 3¢ @ 3½¢ per lb. Russia is quiet at 10½¢ @ 11¢. We quote English Spring Steel at 7¢ @ 8¢, gold; 9¢ @ 11¢ for German; 9¢ @ 11¢ for Machinery; 14¢ @ 15¢ for Cast; 10¢ @ 12¢ for Blister; 8¢ for American Spring; 13½¢ @ 14¢ for Cast; 9¢ for Blister; and 8¢ for Machinery. The steamer Ilyrian, from Liverpool, brought 17 cases Steel, 92 bundles Bar Iron, 132 Bars Iron, order. The steamer Parthia, from Liverpool, brought 1007 bundles Hoop Iron, 52 coils Wire, 12 cases 1-key Galvanized Iron, C. Brewer & Co.; 102 bundles, 24 bary, 1 case, Steel, H. B. Jackson. Copper.—Ingot is dull, and prices have again given away, and we quote at the close 16½¢ @ 16½¢ for large lots. The Ilyrian, from Liverpool, brought 115 cases Yellow Metal, Willett, Hamlen & Co. For Manufacturers we quote: New Sheathing, 28¢; Bolts and Braziers, 30¢; Yellow Metal Bolts, 25¢ @ 25½¢; do. Sheathing, 20¢. Lead is dull and easy, and we again reduce our quotations for the week. We quote: Pig, 3½¢, currency; Sheet, 6¢; Pipe, 6¢; Tin-Lined Pipe, 15¢; Bar Lead, 5½¢; all of these, excepting Pig, are subject to the usual trade or 10% discount. Antimony is firm at 13¢ @ 13½¢, gold, for Boston spot lots. Spelter is easy, closing at \$5.12½ on the spot for 10-ton lots. Tin is weak, and depressed. The Parthia, from Liverpool, brought 643 boxes Tin Plates, order. The Ilyrian, from Liverpool, brought 800 boxes Tin Plates, Thayer & Lincoln; 300 boxes Tin Plates, 20 ingots Tin, order. The Pembroke, from Liverpool, brought 203 boxes Tin Plates, Hubbard, Spencer & Co.; 1711 boxes Tin Plates, order. We quote: Straits, 14½¢ @ 14½¢; Banca, 17½¢ @ 17½¢; Refined English, 14½¢ @ 15¢, gold. We quote Plates: Charcoal, I. C., \$6 @ \$6.25; Coke, \$5.25 @ \$5.50; and Terme, \$5.50 @ \$6, gold.—Commercial Bulletin.

ST. LOUIS.

Special report by Messrs. SPOONER & COLLINS, Iron Commission Merchants, 217 North Third street, St. Louis, under date of May 8: Our market has been rather quiet the past week. Prices remain the same, and there is every indication that they will go no lower. We anticipate a good trade after the 1st of June in all branches of business, and we see no reason why the Pig Iron business should not reap its benefit and improve in demand and also in price.

	No. 1.	No. 2.	Mill.	White and Mottled.
Missouri Stone Coal	\$22.00	\$20.00	\$19.00	\$16.00
Missouri Charcoal	20.00	19.00	18.50	17.00
Tenn. Charcoal	22.50	20.50	19.50	17.50
South. Coke, soft and strong	23.00	21.00	19.00	18.00
Hang. Rock Charcoal	23.00	21.00	20.00	18.00
Hang. Rock Charcoal, Cold-short	23.00	21.00	20.00	18.00
Extra No. 1, I. M. Ore.	No. 1.	No. 2.	No. 3.	No. 4.
Hang. Rock Coke, equal to Scotch	23.00	21.00	20.00	18.00
West Va. Coke	23.00	21.00	20.00	18.00

	No. 1.	No. 2.	No. 3.	No. 4.
COLD-BLAST CHARCOAL—All Numbers.				
Hang. Rock	22.00	20.00	19.00	18.00
Tennessee	22.00	20.00	19.00	18.00
Kentucky	22.00	20.00	19.00	18.00
Missouri	22.00	20.00	19.00	18.00
Georgia	22.00	20.00	19.00	18.00
Alabama	22.00	20.00	19.00	18.00
Assorted Bar Iron	22.00	20.00	19.00	18.00
No. 1 Railroad	22.00	20.00	19.00	18.00
Heavy Cast Scrap	22.00	20.00	19.00	18.00
Light	22.00	20.00	19.00	18.00
Old Rails	22.00	20.00	19.00	18.00
Old Car Wheels	22.00	20.00	19.00	18.00

LOUISVILLE.

Messrs. GEO. H. HULL & Co., under date of May 13, write us as follows: Trade in Pig Metal continues good, but with a continued disposition to purchase for immediate wants only, in spite of the low prices now ruling, that should apparently stimulate buyers to stock up for the future. The usual time, 4 mos., is allowed on the quotations below:

	No. 1.	No. 2.	No. 3.	No. 4.
FOUNDRY IRONS.				
No. 1 Hanging Rock, Charcoal	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00
No. 1 Southern, Charcoal	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00
No. 1 Hanging Rock, Stonecoal and Coke	22.00	20.00	19.00	18.00
No. 2 Hanging Rock, Stonecoal and Coke	22.00	20.00	19.00	18.00
No. 1 Southern, Stonecoal and Coke	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00
"American Scotch"	22.00	20.00	19.00	18.00
Silver Gray	22.00	20.00	19.00	18.00

	No. 1.	No. 2.	No. 3.	No. 4.
MILL IRONS.				
No. 1 Charcoal, Cold-short and Neut'l	16.00	17.00	18.00	19.00
No. 2 Stonecoal and Coke, Cold-short and Neut'l	16.00	17.00	18.00	19.00
No. 3 Stonecoal and Coke, Cold-short and Neut'l	16.00	17.00	18.00	19.00
No. 4 Stonecoal and Coke, Cold-short and Neut'l	16.00	17.00	18.00	19.00
White and Mottled, Cold-short and Neut'l	16.00	17.00	18.00	19.00

	No. 1.	No. 2.	No. 3.	No. 4.
CAR WHEEL AND MALLEABLE IRONS.				
Hang. Rock, Cold-blast	32.00	34.00	36.00	38.00
Alabama and Georgia, Cold-blast	32.00	34.00	36.00	38.00
Kentucky, Cold-blast	32.00	34.00	36.00	38.00

Messrs. W. B. BELKNAP & Co., Iron and Steel Merchants, Louisville, Ky., under date of May 13, report: Business fair, there being a slightly better demand than characterized the two or three weeks previous. Stove men report a good movement in tinners' stock. Light hardware quiet and metals dull. There is an appreciable lack of confidence in everything, notwithstanding occasional recovery, which makes the future seem uncertain. Careful and extended inquiry develops a strong feeling against Congressional agitation of tariff, bankrupt act, eight-hour law and electoral count, which go to kill industry, delay prosperity, and, consequently, foster communism, which, in some localities, is assuming troublesome shape. Last year, after the presidential inauguration, business of all kinds received fresh impetus, but ever since Congress met the state of the country has been growing worse. We want to see a repeal of the bankrupt law, appropriations passed, and then adjournment. Trade would speedily regulate itself without the assistance of politicians, who, it is believed, would not hesitate to precipitate revolution if a private end was to be gained. We quote the above as the prevailing sentiment of business men and manufacturers in this section, and only wish

it had more weight at Washington. Prospects of excessive crops hereabouts are somewhat modified by cold, damp weather.

CINCINNATI.

Messrs. E. L. HARPER & Co. (successors to Messrs. L. R. HULL & Co.), under date of May 13, write us as follows: We have not had a very active demand, and nothing particularly noteworthy has transpired in the market during the week just closed. Prices range about the same, and there does not appear to be any change in the condition of the market. We quote:

	No. 1.	No. 2.	No. 3.	No. 4.
Hanging Rock, No. 1 Charcoal	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00
No. 1 Coke	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00
No. 1 Stonecoal	22.00	20.00	19.00	18.00
Virginia, No. 1 Coke	22.00	20.00	19.00	18.00
Ala. and Tenn. No. 1 Charcoal	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00
Shawnee, No. 1 Stonecoal	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00

	No. 1.	No. 2.	No. 3.	No. 4.
Hanging Rock, No. 1 Charcoal	22.00	20.00	19.00	18.00
Hanging Rock, No. 1 Coke	22.00	20.00	19.00	18.00
Virginia, No. 1	22.00	20.00	19.00	18.00
Ala. and Tenn. No. 1 Charcoal	22.00	20.00	19.00	18.00
Red-short, No. 1 Coke	22.00	20.00	19.00	18.00
Cold-short, No. 1 Stonecoal	22.00	20.00	19.00	18.00
Old Rails, according to quality	22.00	20.00	19.00	18.00

	No. 1.	No. 2.	No. 3.	No. 4.
CAR WHEEL AND MALLEABLE IRONS.				
Hanging Rock	32.00	34.00	36.00	38.00
Southern and Western Brands	32.00	34.00	36.00	38.00
Virginia Hematite (Washed)	4.25	4.25	4.25	4.25

RICHMOND.

Mr. ASA SNYDER, Iron Merchant and Furnace Agent, Richmond, Va., writes as follows under date of May 13: Very little doing the past week in iron. Prices remain nominally as below:

	No. 1.	No. 2.	No. 3.	No. 4.
Va. Cold-blast Charcoal, Cold-short	22.00	20.00	19.00	18.00
Va. Warm-blast	22.00	20.00	19.00	18.00
Anthracite, American Scotch	22.00	20.00	19.00	18.00
No. 1	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00
No. 3	22.00	20.00	19.00	18.00
No. 4	22.00	20.00	19.00	18.00
Coke, (West Virginia) No. 1	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00
Old Rails	22.00	20.00	19.00	18.00
Wrought Scrap No. 1	22.00	20.00	19.00	18.00
Cast (machinery)	22.00	20.00	19.00	18.00
Richmond Refined Bar Iron	22.00	20.00	19.00	18.00
Shoe Sholes per keg	4.50	4.50	4.50	4.50
Mule	4.50	4.50	4.50	4.50
Old Dominion Nails, Standard Size	4.50	4.50	4.50	4.50
Freight to New York, \$1.75; Philadelphia, \$1.50, per ton of 2400 lb.				

BALTIMORE.

Mr. W. N. WYETH, Iron and Steel Merchant, 46 and 48 South Charles street, reports us the following prices, under date of May 13: Business for the past week has ruled only moderately fair for the season. Margins are close, with values firm at unchanged figures.

	No. 1.	No. 2.	No. 3.	No. 4.
AMERICAN REFINED BAR IRONS.				
1 to 6 wide by ½ to 1 thick	1.95	1.95	1.95	1.95
1 to 4½ wide by ½ to 1 thick	1.95	1.95	1.95	1.95
Round and Square, ordinary sizes	1.95	1.95	1.95	1.95
from ½ to 1 inclusive	1.95	1.95	1.95	1.95
Hoop iron, ½ wide and upward	3	3	3	3
Band Iron, ½ wide and upward	3	3	3	3
Hoop-iron 1½ to 1 wide by ½ to 1 thick	3	3	3	3
Norway Nail Rods	3	3	3	3
Black and Blue	3	3	3	3
Squares and Octagons, ordinary sizes	14	14	14	14
Machinery Steel	8	8	8	8
Cast Spring Steel	8	8	8	8
Homogeneous Steel Plate	8	8	8	8
Perkins' Horse shoes, ½ keg of 100 lbs.	3.75	3.75	3.75	3.75
Mule shoes	4.37	4.37	4.37	4.37
R. R. Spikes	2.50	2.50	2.50	2.50
Common Horse Nails	8	8	8	8
Putnam Horse Nails	18	18	18	18
Goose Horse Nails	18	18	18	18
Less list discount to the trade				

Messrs. R. C. HOFFMAN & Co., Iron and Commission Merchants, No. 23 South Frederick street, report the Pig Iron market as follows, under date of May 13: We have no material change in the iron markets and repeat last quotations, viz.:

	No. 1.	No. 2.	No. 3.	No. 4.
Baltimore Charcoal Pig	22.00	20.00	19.00	18.00
Virginia	22.00	20.00	19.00	18.00
Anthracite No. 1	22.00	20.00	19.00	18.00
No. 2	22.00	20.00	19.00	18.00
No. 3	22.00	20.00	19.00	18.00
Mottled and White	22.00	20.00	19.00	18.00
Charcoal, C. B. Blooms	22.00	20.00	19.00	18.00
Homogeneous Steel Plate	22.00	20.00	19.00	18.00
Refined Blooms	22.00	20.00	19.00	18.00

FOREIGN.

FRANCE.

(Moniteur des Interests Matériels.)
PARIS, April 25, 1878.—Metals.—As we are on the eve of the opening of the Exhibition, business has slackened during the week, including the metal trade. The demand for Copper has been moderate in the extreme, and the tendency if anything downward. We quote, nominally, Chili Bars, 170 francs the 100 kilos; Common ditto, 165; and Pure Corcoro Ore, 175. Manganese has remained quiet and unaltered. They quote Spanish in slabs, 150; Red Toked, 160 @ 165; Small Refined Ingots, 175; Sheathing, 195; Bolts, 200; and Yellow Metal Sheathing, 190. Tin has also become quiet weak. We quote, nominally, Banca here, 181 francs the 100 kilos; Straits and Australian, 170; Billiton, 172, 50; and English at Havre and Rouen, 167, 50. Manganese remains steady. Their quotations are as follows: Banca, 180; Straits 165 @ 170; Billiton, 170, and English Refined, 180. Lead.—The heaviness in this metal has found no relief yet. We quote Spanish and English, 43; other descriptions, 45, 50 francs the 100 kilos. Manganese remains firm. They quote, First Fusion Soft, 41, 50 @ 42; Second ditto, 40, 50; Sheet and Pipe, 48, and Shot, 48. Spelter.—No change has occurred in this metal. The range here and at Havre remains 48 @ 49 francs the 100 kilos. Manganese quotes as heretofore, Sheet Zinc, 61 @ 63, and Old Remelted, 43 @ 44. Iron.—Affairs in this branch are progressing satisfactorily. The impending Exhibition is spreading a good deal of activity among our lock makers and machinists. Consumers are forced into the market and prices hardened in consequence. Prices, moreover, had been lowered considerably in order to stimulate the demand, and they are susceptible of improvement. In the Haute-Marne merchant iron is neglected by consumers. The demand in that locality is restricted to Chains, Wire and Nails, without any change in rates. There is not much doing in the Ardennes. The Champagne Iron works have sent some important orders to the blast furnaces in the Meurthe and Moselle. Common Pig Iron and Second Fusion are selling with the greatest ease. Affinage is being paid 6 francs, with a rising tendency. A better feeling is clearly perceptible. The Chatillon and Commeny companies have been awarded the job of furnishing the Algerian telegraph lines, 120 tons galvanized iron wire. In the northern district some orders have dropped in, and rates are stiffening. In the Hainaut prices are sustained, although no further orders have come to hand in the locality; the Easter holidays have somewhat interrupted business, and beside the larger establishments are busy in hurrying off their goods to the Exhibition. Coal.—Common Coal is a little firmer, the arrivals are lighter, and the companies and large holders show less anxiety to meet the market, the more so as freights are also higher.

BELEMUN.

(Revue Universelle.)
BRUSSELS, April 25, 1878.—Iron.—The Paris Exhibition still absorbs the attention of people in the

iron trade to such an extent that business has again been very dull, and attendance on 'change quite slim. This being the case, we have availed ourselves of the fall, and have been in Paris in the meantime. The machinery department is still quite backward. The Cockerill Society, as well as the Serang Steel Works are there with a rail rolling mill each. Messrs. Dubois and Francois exhibit a 2-horse-power air compressor of a new model. Mr. C. Beer, machinist, of Tempepe exhibits a coal extruding machine of great merit. Mr. Chaudron exhibits a magnificent boring apparatus for mining wells

IN CLEVELAND

the iron market remains weak, there being some reluctance to enter into long-dated engagements by reason of the threatened possibility of Russian privateering. Some remarks at a recent meeting in St. Petersburg threatening to close the Tyne ports by this means have caused what is probably an altogether unnecessary and unwarranted flutter. Last week's shipments from the port of Middlesbrough were rather more than 15,000 tons of pig, which went to sundry Continental ports, excepting a consignment of 500 tons to Japan (Yokohama) in the steamship Hideyorki. Is this to be accepted as the initiative of a large trade with the celestials, or is it merely a sort of *lusus nature*? The finished iron shipments from Middlesbrough included various coast-wise lots; 914 tons of iron rails, with fish bolts and spikes, to Rivoli Bay, manufactured iron to Spain, and 1321 tons of iron rails with accessories, to Wallaroo.

TRADES OF SHEFFIELD.

The iron trade of Sheffield is dull and altogether as quiet as when I last had occasion to write of it on your behalf. The smelters outside the town are mostly producing a good deal of pig, but they use nearly the whole of the output up themselves for foundry castings and general purposes, the balance going into the Staffordshire and Lancashire markets at prices which completely cut out the local productions of similar qualities. All kinds of merchant iron are unchanged, on the basis of £5. 15/ @ £6. 5/ for bars of the ordinary kind, such as William Cooke & Co.'s common numbers. At Brown's and Cammell's very little is being done in the armor-plate mills pending further experiments as to the merits of steel as against iron, but at both establishments the boiler and ship plate mills are doing a good deal of work.

Steel wire is not selling so well as it has been, the best call just now being for No. 4 W. G., for needle making, at full prices, and inferior grades for hackle and gill pins. There used to be some good Russian orders in the market, but the war appears to have stopped them—indeed, reports from many quarters speak of the extreme depression of the Muscovite demand for this and other articles of Sheffield manufacture. A rumor has reached me to the effect that one very eminent local house—known all over the world—is about to close its edge-tool, saw, and file departments until trade revives. There is a good business doing at the gun works of Firth & Sons, who are turning out considerable lots of 20-ton guns for Woolwich. Each of these large pieces of ordnance requires about 25 tons of ingots, the odd five tons being got rid of in the processes of heating, forging, hammering, boring, turning, &c. In some other branches of the steel, &c., trades, it is believed "the corner has been turned," a large number of inquiries having this week been in circulation. In the file trade a severe discount war is going on. Some firms (I might mention well-known names) are allowing as much as 55 per cent. off list, and are even supplying ordinary consumers at those figures, "whereby," says a private correspondent, "trade is fearfully cut up, and, if continued, merchants ought to have at least 70 per cent. off, and ironmongers 67½ per cent., otherwise what chance have the latter to sell at all." One Sheffield firm is not only dealing in this way with consumers direct, but is positively giving 12 months' credit, evidently with the idea of getting together a connection while trade is bad in order to work it to advantage when things revive. Other houses in the town, however, have also extended their discounts by 2½ additional during the past week or two, owing to the close competition that exists. In this branch, nevertheless, some of the manufacturers have recently been doing quite a brisk business. Cutlery is in very fair request, especially best kinds.

STAFFORDSHIRE AND BIRMINGHAM are precisely as before. With them the *status quo ante bellum* means much the same dead and unrelieved level as it has done any time these three, six or nine months—so far as the iron works are in question. About a third, or hardly that proportion, of the furnaces are in blast, and in the mills none save those of the best firms are running more than half time. Prices are wholly unchanged, nominally, best marked bars at £8. 10/, and other kinds in proportion. Need I waste space in order to say that nobody is adhering to the list, or to express my opinion that the said "list" is an absolute and inconvenient contrivance? At Birmingham itself most of the leading lighter industries are rather quiet, except in such of them as are now beginning to feel the season's spurt—such as the trunk, traveling box, bath and electro branches. In several branches the competition of your manufacturers is an acknowledged fact. The *Ironmonger*, for instance, has a special article on mortise locks, in which it is asked why English locks of that kind are filed bright, while yours are japanned and German ones tinned or galvanized? The writer of the article says that cheap American locks—all cast—are being introduced into Staffordshire at "astonishingly low prices"—but condemns them as bad qualities. The secretary of the Hollowware and General Ironfounders' Association also writes to the *Ironmonger* in condemnation of American cast iron door hinges. Mr. Westinghouse's

TUBE QUESTION is further discussed in the paper just named by the "representative of the tube manufacturer referred to," who says he did not agree with Mr. W. as to the alleged worthless character of all English gas tubes, and proceeds: "With regard to his comparison of prices, Mr. W. has, in the English list, taken the rates for the steam tubes from the butt-welded gas list, instead of giving them, for sizes above 2 inches, from the lap-welded list, and which are as follows, viz.:

3/4 inches	5 inches	3 1/2 inches	4 inches
2/6	4	3/7	4 1/2 per foot.

"The manufacturers here are not alarmed at the idea of our American friends underselling us on our own ground, as it would appear that the case is quite the reverse. It certainly is not the almost worthless character of our tubes that prevents our selling them in New York at the present moment,

but it is the not very light prohibitory duty of about 35 % under which our friends take shelter."

SOUTH WALES AND MONMOUTHSHIRE

are also in an almost lethargic condition, albeit the iron shipments were last week on a rather larger scale than for some weeks previous, the total reached having been 5635 tons, including 2050 tons rails to Newcastle, New South Wales, by the Dowlais Iron Company; 1225 tons to Vera Cruz, by the same firm; 936 tons to Bahia, 650 tons to Drontheim and 500 tons to Sundswall, by the Rhymney Iron Company; 20 tons bars to Smyrna, by the Llynvi Iron Company; 30 tons tin to Rouen. Of Spanish ore over 5000 tons were imported into Newport during the week. Tin plates are in good request, but the full results of last week's meeting have not as yet become operative. There is little doubt, however, of the success of the experiment for a time.

THE METAL MARKETS

were very quiet all last week, owing to the holidays. The business of the period is thus summarized by the *Ironmonger*: "Copper has been quiet all the week, but in some cases rather less money has been accepted; 345 tons of Cape ores were sold on Wednesday by public tender at about 12 1/4 % unit for 38 3/4 %. A cargo of Peruvian ore was sold by private contract at 12 3/4 %. The demand for Chili bars has shown no animation and transactions have been confined to 50 tons of "Julian" at £63. 10/, cash, 25 tons Guayanac Urmeneta at £63. 5/ ditto; 150 tons good ordinary brands at £62. 17/6 @ £62 ditto; and of 100 tons at £63. 10/ with three months' fixed prompt, the market closing steady at £62 @ £62. 5/ for good ordinary marks, cash. Australian has also continued quiet. Burra is £71, and 20 tons Wallaroo have been sold at £73. Little change has occurred in English; tough, £68 @ £69; best selected, £69. 10/ @ £70. 10/; strong sheets, £73. Tin has receded still further during the past few days, and prices are weaker than prior to the Easter holidays. Both Straits and Australian have figured at £62 @ £63, the market now standing at £62 @ £62. 5. English ingots have also been neglected at the nominal price of £67. During the week there have been imported in the Indus, from Penang, 4593 slabs; in the Hector, from the Straits, 2873 slabs; in Wm. Duthie, from Sydney, 5790 ingots, and in the Luffa, from Hobart Town, 371 slabs. Tin plates are slightly dearer, owing to a determined effort of the Welsh makers to bring about a considerably restricted production, and so raise the level of prices. At Liverpool this has already had the effect of putting on about 3d. @ 6d. per box. Lead has remained in poor request at £17. 2/6 @ £17. 7/6 for English pig, and about £17 for soft Spanish without silver, as before. Spelter dull and unchanged at £18 @ £18. 5/ for English soft, and V. & S. £18. 2/6 net at Swansea. Zinc is still held at £20. 15/ @ £21 for London rolled. Quicksilver is unaltered at £7 per bottle, with only a limited amount of business doing. Antimony, as last week, at £49 @ 50. To-day's official opening report of the London Metal Exchange: Copper.—Chili bars steady, G. O. B., £62 @ £62. 5/; named and best brands, £62. 10/ @ £63. 10/; Wallaroo, £73; Burra, £71; English tough, £68 @ £69; best selected, £69 @ £70. 10/. Tin.—A slow market, at £62 for Straits and Australian; English ingots, £66. 10/. Lead.—English pig, £17 @ £17. 5/; soft Spanish, without silver, £16 17/6. Spelter.—£18 @ £18. 5/ for ordinary brands. Quicksilver.—£7. Antimony.—£49. 10/ @ £50 for English star." The *Mining Journal* thinks there can be no expansion of trade until confidence is restored.

At Liverpool metals are quiet and unchanged in price. The tin-plate market there is thus reported upon by Robert Crooks & Co.: "The market has become firmer this week, owing to the idea among makers that production will be lessened by one-third. In many cases 3d. @ 6d. advance is wanted, but buyers prefer waiting rather than pay this. The consent of several makers is still wanted before the agreement to reduce the make can come into effect. To-day's quotations are: Charcoal tins, 17/9 @ 20/; charcoal tines, 16/9 @ 19/. Coke tins, 15/ @ 16/6; coke tines, 14/3 @ 15/6."

The Coal Business at Cincinnati.

To the Editor of The Iron Age: Illustrative of the extensive coal business done at Cincinnati last year, I find from the recent annual report of Col. S. D. Maxwell, Superintendent of the Chamber of Commerce, that over 40,000,000 bushels of coal was handled by our dealers. This very large amount gives Cincinnati the front rank as the largest coal distributing point west of Pittsburgh; four-fifths of all the coal comes from the latter place, the balance from West Virginia and Ohio.

It is an interesting fact that the powerful tow-boats bring down the Ohio from Pittsburgh acres of coal in area, displacing a depth of water 6 to 7 feet, an ordinary tow-boat being able to safely pass all the bridges and danger points on the Ohio with from 200,000 to 250,000 bushels of coal. The Pittsburgh tow-boat J. B. Williams arrived at New Orleans last month with 602,000 bushels. We understand this is the largest single tow that ever arrived at that market. The capacity of these boats which are so successfully managed in points of skill and economy, renders the cost of coal so moderate, delivered at Cincinnati by river, that all competition for this business on the part of railroads is abortive and entirely conceded to nature's water highway. The stringency of the times and efforts of the rival extensive coal operators have resulted in cutting off all the corners in this business, until it is now conducted on the most improved hardpan basis. In proof of the advantage of river transportation over that of rail, a barge of coal containing 12,000 bushels can be delivered by river from Pittsburgh to Cincinnati for \$100; by rail it would require 40 cars, 300 bushels per car, at lowest cost freight rate of \$40 a car, aggregating \$1600—a difference of \$1500 in favor of river transportation. This practically demonstrates its superiority.

To provide for the contingency of low water our dealers anticipate the wants of

their trade by laying in large stocks of coal, virtually transplanting coal mines. To this end the Phillips Coal Elevator Company, located here, have increased their extensive yard facilities to cover their engagements for gas coal, to be delivered during the year to the remotest points in the West and Northwest accessible by rail. I am indebted to the courtesy of J. H. J. Smith, of the above firm, for some of the data of this communication. Our large coal elevators can now conveniently handle 10,000 bushels of coal per day; being located near the river and having complete trackage facilities, they are enabled to handle coal at a very small figure.

I am reliably informed that the State Geologist, in his survey of the bituminous coal regions of Western Pennsylvania, specifies that coal cropping out on the Youghiogheny and Monongahela rivers as the richest gas coal, and that, excepting the Westmoreland coal from the gas coal bed on the Youghiogheny River shipped East by rail, all coal in the interior on railroads is an inferior grade. Hence, it is the good fortune of our city to take front rank in quality as well as quantity. Our railroad facilities are equal to any in the country, and able to make low competing rates to any point in Indiana, Illinois, Michigan, Iowa and Missouri.

The future of the coal business in our city is most flattering, the average daily consumption being now at the rate of 100,000 bushels per day throughout the year, with a fair prospect of doubling that quantity within ten years. YOUGHIOGHENY. CINCINNATI, OHIO, May 13, 1878.

The Founding of Alloys.*

BY EDWARD KIRK.

V.

HARD-SOLDERING.

Hard-soldering is the art of soldering or uniting two metals or two pieces of the same metal together by means of a solder that is almost as hard and infusible as the metal to be united. In some cases the metals to be united are heated to a high heat, and their surface united without solder by means of fluxing the surface of the metals. This process is then termed brazing, and some of the hard-soldering processes is also often termed brazing; both brazing and hard-soldering is usually done in the open fire on the brazier's hearth.

When soldering work of copper, iron, brass, &c., the solder generally used is a fusible brass, and the work to be soldered is prepared by filing or scraping perfectly clean the edges or parts to be united. The joints are then put in proper position and bound securely together with binding wire or clamps; the granulated solder and powdered borax are mixed in a cup with a very little water and spread along the joint to be united with a strip of sheet metal or a small spoon. The work is then placed upon a clear fire and heated gradually, to evaporate the water used in uniting the solder and borax, and also to drive off the water contained in the crystallized borax, which causes the borax to boil up with an appearance of froth. If the work is heated hastily the boiling of the borax may displace the solder, and for this reason it is better to boil or roast the borax before mixing with the solder. When the borax has ceased to boil the heat is then increased, and when the metal becomes a faint red the borax fuses quietly like glass, and shortly after, as the heat of the metal is increased to a bright red, the solder also fuses, which is indicated by a small blue flame from the burning of the zinc. Just at this time the work should be jarred slightly by being tapped lightly with the poker or hammer, to put the solder in vibration and cause it to run into the joint. For some work it is not necessary to tap it with the poker, for the solder is absorbed into the joint and nearly disappears without tapping.

In order to do good work it is necessary to apply the heat as uniformly as possible, so as to have the solder melt uniformly. This is done by moving the work about in the fire. As soon as the work has been properly heated and the solder has fused, the work should be removed from the fire, and after the solder has set it may be cooled in cold water without injury. Tubes to be soldered are generally secured by binding wire twisted together around the tube with the pliers. All tubes that are soldered upon the open fire are soldered from within, for if they were soldered from the outside the heat would have to be transmitted across the tube with greater risk of melting the lower part of the tube, the air in the tube being a bad conductor of heat, and it is necessary that both ends of the tube should be open so as to watch for the melting of the solder. In soldering long tubes the work rests upon the flat plate of the brazier's hearth, and portions equal to the length of the fire are soldered in succession.

The common tubes or gas pipe are soldered or welded from the outside. This is done by heating the tube in a long air furnace, completely surrounded by hot air, by which means the tube is heated more uniformly than in the open fire. After the tubes have been heated to the welding heat they are then taken out of the furnace and drawn through clamps or tongs to unite the edges, and are then run through grooved rollers two or three times, and the process is complete. The soldering or welding of iron tubes requires much less precaution in point of the heat than some of the other metals or alloys, for there is little or no risk of fusing it. In soldering light ironwork, such as locks, hinges, &c., the work is usually covered with a thin coating of loam to prevent the iron from being scaled off by the heat.

Sheet iron may be soldered at a cherry-red heat, by using iron filings and pulverized borax as a solder and flux. The solder and flux are laid between the irons to be soldered, and the whole is bound together with binding wire and heated to a red heat and taken from the fire and laid upon the anvil, and the two irons are united by a stroke upon the set hammer. Steel or heavy iron may be united in the same way at a very low heat.

For soldering iron, steel and other light-colored metals, and also brass work that re-

quires to be very neatly done, the silver solder is generally used on account of its superior fusibility and combining so well with most all metals, without gnawing or eating away the sharp edges of the joints. Silver solder is used a great deal in the arts, and from the sparing or careful way in which it is used most work requires but little or no finish after soldering, so that the silver solder, although expensive, is in reality the cheapest solder in the long run. For silver soldering the solder is rolled into thin sheets and then cut into narrow strips with the shears. The joints or edges to be united are first coated with pulverized borax which has been previously heated or boiled to drive off the water of crystallization. The small strips of solder are then placed with forceps upon the edges or joints to be united, and the work is then heated upon the brazier's hearth. The process of silver-soldering upon the larger scale is essentially the same as the operation of brazing.

For hard-soldering small work, such as drawing instruments, jewelry, buttons, &c., the blow-pipe is almost exclusively used, and the solder used is of the finest or best quality, such as gold or silver solder, which is always drawn into thin sheets or very fine wire, and it is sometimes pulverized or granulated by filing; but if solder is pulverized very fine a greater degree of heat is always required to fuse a minute particle of metal than is required to fuse a large piece.

In soldering jewelry, the jeweler usually applies the borax or other flux in solution with a very small camel-hair brush. The solder is rolled into thin sheets and then clipped into minute particles of any desired shape or size, which is so delicately applied to the work that it is not necessary to file or scrape off any portion of it, none being in excess. The borax or other flux used in the operation is removed by rubbing the work with a rag that has been moistened with water or diluted acids.

SOFT-SOLDERING.

Soft-soldering is the art of soldering or uniting two of the fusible metals or two pieces of the same metal. The solder used is a more soft and fusible alloy than the metals united, and is termed soft-solder; and as it is very fusible the mode of applying the heat is consequently very much different from that employed in hard-soldering.

The soft-solders are prepared in different forms to suit the different classes of work for which they are intended. Thus for tin soldering it is cast into bars of 10 or 12 inches long by 1 inch wide, and by some it is cast into cakes 10 or 12 inches long by 3 or 4 inches wide.

The plumber's solder is generally cast into small ingots or cakes, two or more inches square, according to the work for which they are intended and size of pot they are to be melted in. Some of the very fusible solders that are intended for very light work are trailed from the ladle upon an iron plate, so as to draw the solder into thin or large bars, so that the size of the solder may always be of a size to suit the work that it is used upon. In soft-soldering it is very essential that the parts to be united should be perfectly clean and free from any metallic oxides, and for this reason the parts to be united are generally wet with a little chloride of zinc before applying the solder, and when the metal is old or very dirty it must be scraped on the edges intended to be united before applying the solder.

When soldering lead pipe, sheet lead, &c., the plumber first smears a mixture of size and lampblack around the intended joint to prevent the melted solder adhering to the metal at a point where it is not wanted. The parts to be united are then scraped quite clean with the shave hook, and the clean metal is then rubbed over with tallow. The wipe joints are usually made without using the soldering iron. The solder is heated in the plumber's pot rather beyond its melting point, and poured plentifully upon the joint to heat it. The solder is then molded into the proper shape and smoothed with the cloth or several folds of thick bed ticking, which is well greased to prevent burning, and the surplus solder is removed with the cloth.

In forming the striped joint the soldering iron and cloth are both used at the commencement in molding the solder and heating the joint. In forming this joint less solder is poured on than when forming the wiped joint, and a smaller quantity remains upon the work. The striped joints are not so neat in appearance as the wiped joint, but they are claimed by many to be sounder from the solder having been left undisturbed when in the act of cooling. But in the wiped joint the body of the solder is heavier, and the shrinkage of it around the pipe is sufficient to unite the pipe, even if the solder does not thoroughly unite with the pipe. In forming joints on lead pipe the cloth is always used to support the fluid solder when poured on the pipe. Light lead work that requires more neatness than the ordinary plumber's soldering iron.

The tinner's soldering iron, as it is commonly called, is made of a square piece of copper weighing from three or four ounces to three or four pounds, according to the size of work it is intended for. This piece of copper is drawn down to a long, square point, or to flat wedge shape, and riveted into an iron shank, and the shank fitted with a wooden handle. The copper bit, or soldering iron, is then heated in the tinner's fire-pot with charcoal to a dull red heat, and is then screwed in the vise and hastily filed to a clean metallic surface. It is next rubbed with a piece of sal-ammoniac, or on some powdered resin, and then upon a few drops of solder in the bottom of the soldering pan. In this way the soldering iron is thoroughly coated with tin, and is then ready for use.

In soldering tin-plate work the edges are slightly lapped over each other, and the joint or seam is strewn with powdered resin, which is usually contained in a small box set in the soldering pan. The soldering iron, which has been heated in the fire-pot, is then drawn over the cake of solder, and a few drops are melted and adhere to the soldering iron, and is distributed by it along the joint or seam. In large work the seams are first tacked together, or united by drops of solder so as to hold the seams in proper position while being soldered; but this is seldom

done in small work, which can be easily held together with the hands. Two soldering tools are generally used, so that while one is being used for soldering the other one is being reheated in the fire-pot, and thus avoiding the delay of waiting for the tool to heat. The temperature of the tool is very important, for if it is not hot enough to melt the solder it must be returned to the fire; and if it gets too hot the tinning will be burnt off and the solder will not hang to it, and the tool must be retinned before it can be used. In soldering tinware the tool is usually passed only once over the work, being guided by contact with the fold or ledge of the seam; but when the operator is not an expert he usually runs the tool backward and forward over the work two or three times. This makes slow work.

Sheet copper, in common work, is soldered with the soldering iron in the same manner as sheet tin, but the finer or more important work is brazed or hard soldered. In soft soldering copper, as well as sheet iron, the flux generally used is powdered sal-ammoniac, or a solution of sal-ammoniac and water. A piece of cane, the end of which is split into filaments to make a stubby brush, is used for applying the solution to the work, and powdered rosin is subsequently applied. Some workmen mix the powdered sal-ammoniac and rosin together before applying it to the work. This they claim is better than applying them separately, but so long as the metals are well defended from oxidation either of the modes is equally good, for the general principle is the same in both. Zinc is the most difficult metal to solder, and the joints or seams are seldom so neatly formed as in tin or copper. Zinc will remove the coating of tin from the soldering tool in a very short time. This arises from the superior affinity of copper for zinc than for tin, and the surface of the tool is freed from tin, and is coated with zinc. Sal-ammoniac is sometimes used for a flux in soldering zinc, but the most common flux used for zinc is muriate of zinc, which is made by dissolving fragments of zinc in muriatic acid diluted with about an equal amount of water. This solution is put in a wide-mouthed bottle, and small strips of zinc dropped into it until they cease to be dissolved. The solution is then ready for use, and is termed muriate of zinc. This solution is likewise used for almost all the other metals, as it can be used without such strict necessity for clean surfaces as when some of the other fluxes are used.

In soft soldering the soldering iron is only used for thin sheet metals, because, in order to unite two metals by soldering, the temperature of the metals must be raised to the melting point of the solder, and a heavy body of metal cannot be sufficiently heated with the soldering iron without heating it to too great a heat, which is apt to burn off the coating of tin, or to cause it to be absorbed by the copper, as in superficial alloying, and the solder will not adhere to the tool, and cannot be spread along the joint by it; and in soft soldering heavy work the work is first filed or scraped perfectly clean at the points to be soldered, and is dipped into a bath of melted solder, which is covered with a little melted sal-ammoniac to prevent oxidation, and also to act as a flux for uniting the metals. In dipping the work into the bath it first comes in contact with the flux, and is coated by it before it is subjected to the heat, and when dipped into the solder the tin readily adheres to it; and after heavy pieces of metal have been tinned in this way or by the process of dry tinning with mercury they may be soldered with the soldering iron.

When tinning thin pieces of brass or copper alloys for soldering, it is usually done by rubbing a few drops of solder over the part to be tinned with the soldering iron; and if tinned by dipping into a bath it must be quickly dipped, or there is a risk of the thin sheets being melted by the solder.

When tinning iron or steel the work must be allowed to remain in the bath for some time, so as to be thoroughly heated by the bath, or the tin will not be thoroughly united to the iron or steel, and may peel off when cold. Large pieces of iron or steel that are inconvenient to dip into a bath are tinned by heating in the open fire, and rubbing the solder on with the soldering iron, using either sal-ammoniac or rosin as a flux. When tinning in this way the lowest heat that will fuse the solder should be used.

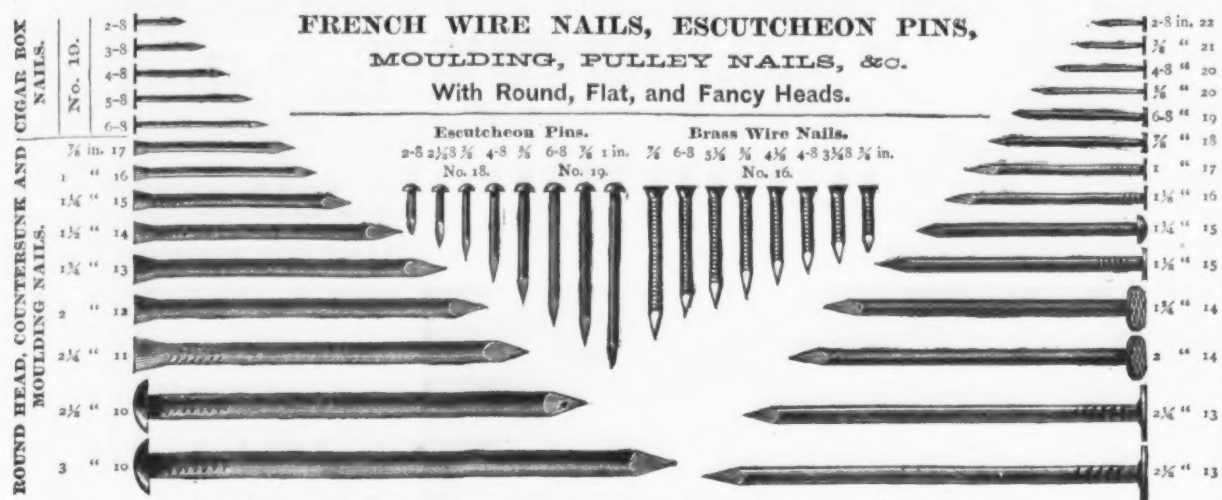
American Goods for Brazil.—Eight locomotives, which have just been turned out by the Baldwin Locomotive Works, were on Monday, the 13th, transferred from that establishment to the hold of the schooner Dora S. Prindall, which sailed from Sansom street wharf, on the Schuylkill River, for Rio de Janeiro. The locomotives were constructed in response to orders from the Brazilian government, seven being intended for the San Paulo and Rio de Janeiro Railroad, and the other for the Railroad Commercio das Flores. The Dora S. Prindall also takes on some 20 cases of selected samples of American manufactures. The goods comprise specimens of artificial flowers, jewelry, prints, watches, soaps, shirts, boots and shoes, car springs, galvanized ironwork, wrought-iron chains and marble and slate mantels. These samples, together with several thousand copies of illustrated catalogues and price lists, will be distributed over the coast, with the object of diffusing a knowledge of the superiority of American manufactures. A number of railroad passenger cars, also constructed to order for the Brazilian government, complete the schooner's cargo.

The heaviest guns in the American navy are 15-inch smooth bores, weighing 42,000 pounds, with a solid projectile of 440 pounds, a shell of 352 pounds and an initial velocity at the muzzle of 1560 feet a second. The English muzzle loader of 80 tons costs \$50,000, the 100-ton \$80,000, and Krupp's breech loader, exclusive of the carriage, \$100,000. Not long since Herr Krupp proposed to lend the English government a gun for \$75,000, but he required an order to be given, in case of success, for guns to the extent of \$10,000,000. These terms were held to be much too onerous and the offer was declined.

HOBART'S TACKS

MANUFACTURED BY
DUNBAR, HOBART & WHIDDEN,
ESTABLISHED 1810.

Office and Salesroom, 116 Chambers Street, New York. . . . Factory, South Abington, Mass.



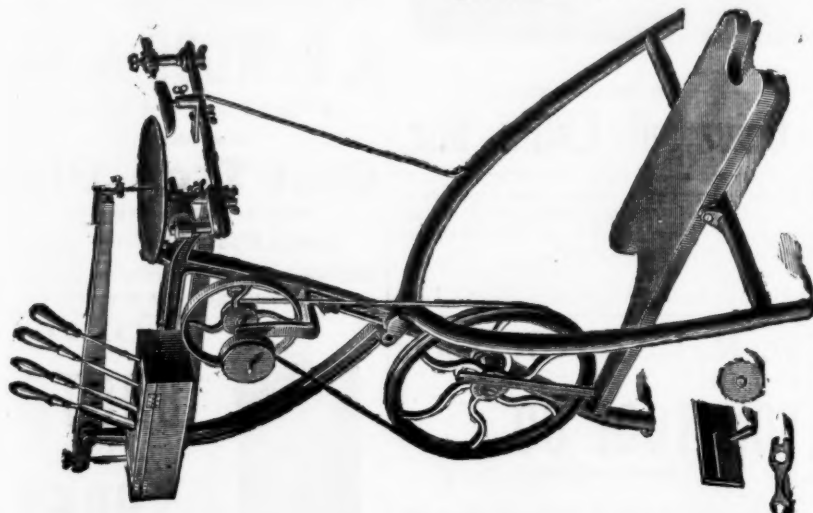
Any Kind of Wire Nails made to order from Description, or Samples.

American and Swedes Iron Tacks,

Tinned, Leathered and Large Head Carpet Tacks, Finishing Nails, Black and Tinned Trunk Nails, Miners' Copper, Gimp, Lace and Brush Tacks, Hungarian, Chair, Cigar Box and Barrel Nails, Glaziers' Points, Iron, Steel, Copper and Zinc Shoe Nails, Patent Improved Brass Shoe Nails, Heel and Toe Plates, Steel Shanks, and Fancy Head Nails, Silver or Japanned Lining and Saddle Nails, A full assortment always on hand at salesrooms, for immediate delivery if required. Odd and Irregular Sizes made to order or cut from sample at short notice. Send for Price List.

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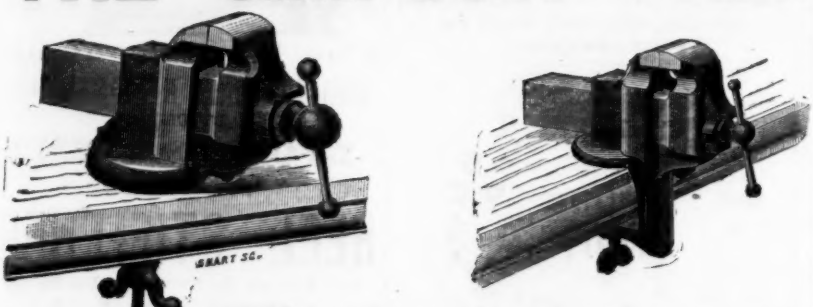
The New Lester Saw is made of Iron, with all the working parts of Steel, and contains all known Improvements to this Date.



It is handsomely painted red and green, with red stripes, and presents a beautiful appearance. Those parts which are not painted are either polished or japanned. We warrant the Saw to be just as herein stated, and we know it will give entire satisfaction, being a more expensive machine than those which we formerly sold for \$25. It consists of—
1st.—A SCROLL SAW, with Tilting Table for inlaid work; arms 18 inches in the clear; clamps which will hold saws of any length or width, and face them in four different directions; cutting lumber from 1-16th to 1 inch in thickness; speed, 1000 strokes per minute.
2d.—A CIRCULAR SAW, 2 1/2 inches in diameter, which will cut lumber one-half inch and less; with an iron table, 4 by 4 inches.
3d.—A DRILLING ATTACHMENT, with six Stubbs' Steel Drills, of various sizes, for wood or iron work.
4th.—An EMERY WHEEL, with wide and narrow rim.
5th.—A TURNING LATHE, with iron ways and rest, steel centres, and three best steel turning tools; length of ways, 12 inches; distance between centres, 6 inches; swing, 3 inches; length of slide-rest, 4 1/2 inches; number of revolutions per minute, 700.
Also, with each machine, six Saw Blades, a Wrench, Screw-driver, extra Belt, and two sheets of Designs, with a nice box for the small tools, and a box for the whole machine. It is taken apart when shipped, and packed in a box, but the working parts are all left in place, and the frame is put together again by a single bolt.
PRICE FOR EVERYTHING ABOVE NAMED, \$8.00.
The same, without the Lathe and Circular Saw, \$6.00.
When desired, we furnish with the Lathe a very nice Drill Chuck, for working metal, and a Tail Stock, with a screw centre, for \$2 extra. The machine alone weighs 47 lbs., and, with the box, 70 lbs.
We also keep a full stock of Tools and Supplies in the Bracket Sawing line.

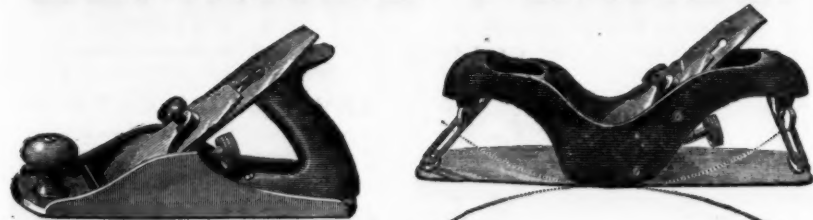
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WITH RAPID ADJUSTMENT AND HARDENED STEEL-FACED JAWS.
Simple, Strong, Durable.

DEFIANCE PLANES.



A finely tempered cutter of Firth's first quality English Steel in every one, whether the list price is 75¢ or \$7.00. Sample orders solicited. Send for catalogue to

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Butchers' Cleavers,
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MANUFACTURERS OF

FINISHED
(BRIGHT OR BLUED)



These nails are made of the best brands of NORWAY IRON, and are guaranteed to be equal to any in the market.

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Foot Power Scroll & Circular Saws, Lathes,
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Hardware Specialties. Send for Lists.

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Genuine Improved Patent

Manufactured by

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Worcester, Mass.



Established in 1839.
We invite the particular attention of the trade to our New Straight Bar Wrench, widened, full size of the larger part of the so called "reinforced or jog bar." Also our enlarged jaw, made with ribs on the inside, having a full bearing on the front of bar (see sectional view), making the jaw fully equal to any strain the bar may be subjected to.

These recent improvements in combination with the nut inside the ferrule firmly screwed up flush, against square, solid bearings (that cannot be forced out of place by use), verifies our claim that we are manufacturing the strongest Wrench in the market.

We would also call attention to the fact, that in 1869 we made several important improvements (secured by patents), on the old wrench previously manufactured by L. & A. G. Coes, which were at once closely imitated and sold as the Genuine Wrench by certain parties who seem to rely upon our improvements to keep up their reputation as manufacturers, and although the fact of their imitating our goods may be good evidence that we manufacture a superior Wrench, we wish the trade may not be deceived on the question of originality. Trusting the trade will fully appreciate our recent efforts, both in improvements on the Wrench and in the adoption of a Trade Mark, we would caution them against imitations. None genuine unless stamped—

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ESTABLISHED 1859.
WM. HASSALL,
Manufacturer of
American and French
Wire Nails

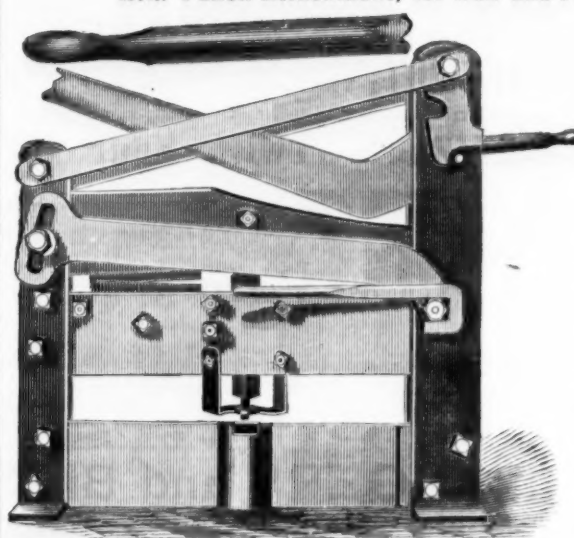
With Flat, Round, Oval, Depressed, Screw and Fancy Heads.

Molding and Finishing Nails, with or without heads. Brush Makers', Upholsterers', Cigar Box, Basket, Chair and Undertakers' Finishing Nails a specialty. Shoe Nails of Brass and Iron. Bright Iron Rivets. Brass and Iron Escutcheon Pins, with flat, round and fancy heads, all sizes on hand and to order.

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PATENT WROUGHT IRON SHEAR,

With Punch Attachment, for Iron and Plow Steel.



Will cut iron 4x 3/4, 1 1/2 round and square. Will punch half inch hole through half inch iron. Weighs 340 lbs.; without punch attachment, 190 lbs. Occupies a space 8x30 in. when not in use, and when in use further space merely sufficient to bring down the lever. It is built so exceedingly strong that two men cannot injure it. Price, \$40.00, at Cleveland; without Punch Attachment, \$25.00. Liberal discount to the trade. Shears for special work made promptly to order.

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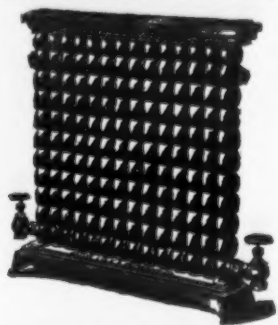
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Wrought Iron Wagon Hardware, Iron Cutters, Punches and Sterling Barn Door Hangers.

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SNOW'S PATENT CAST IRON RADIATOR.



The only Perfect Circulating Radiator in the market
Address the manufacturers.

EATON, COLE & BURNHAM CO.,

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NEW IRON TACKLE BLOCKS.

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Galvanized Malleable Iron Shell and Sheave, Steel Hooks, Steel Pins.

Superior to Wood Blocks on account of not Checking and Cracking.

The Strongest, Lightest, Easiest Running and most Durable Block yet produced.

Send for sample and price list of same to



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Or to J. H. Work, 13 Pearl St., Boston, Mass.; S. H. & E. Y. Moore, 68 Lake St., Chicago, Ill.; Henry B. Newhall, 11 Warren St., N. Y.



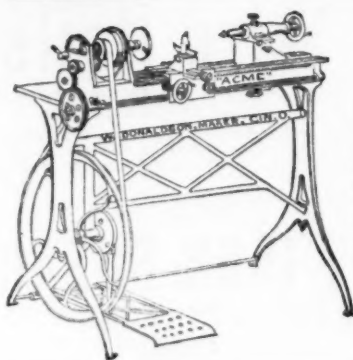
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If so, you can find a remedy in our No. 440 Block. Warranted to work O K or no pay. Try one.



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Cheapest and Best Foot Power Engine Lathe,
Combining the following points:

ACCURACY, DURABILITY, CONVENIENCE, NEAT DESIGN. The result of Special Tools and Workmanship. A proper distribution of metal. A knowledge of what is required. Good taste in proportions.

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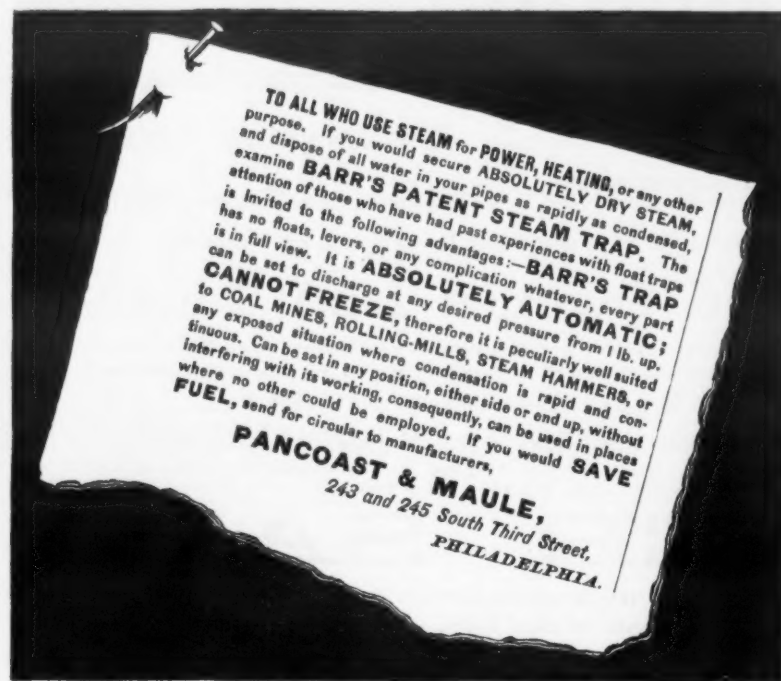
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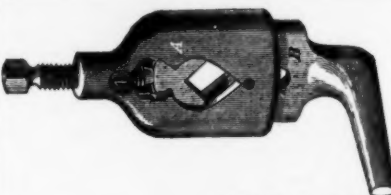
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TO ALL WHO USE STEAM for POWER, HEATING, or any other purpose. If you would secure ABSOLUTELY DRY STEAM, and dispose of all water in your pipes as rapidly as condensed, examine BARR'S PATENT STEAM TRAP. The attention of those who have had past experiences with float traps is invited to the following advantages:—BARR'S TRAP is in full view. It is ABSOLUTELY AUTOMATIC; can be set to discharge at any desired pressure from 1 lb. up to COAL MINES, ROLLING-MILLS, STEAM HAMMERS, or any exposed situation where condensation is rapid and continuous. Can be set in any position, either side or end up, without interfering with its working, consequently, can be used in places where no other could be employed. If you would SAVE FUEL, send for circular to manufacturers.

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NORTH'S PATENT

Universal Lathe Dog.

It is very strong. Holds very strong. Will not deface finished work. Holds round, square or irregular work. Always stands up square with the work and will not "skew." Is more evenly balanced than the common dog.

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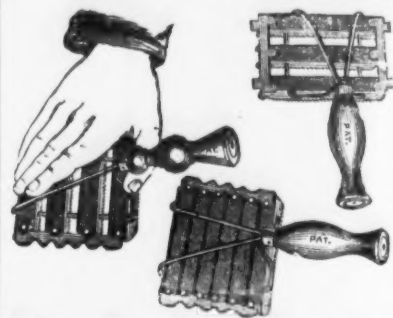
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The Perfect Comb.

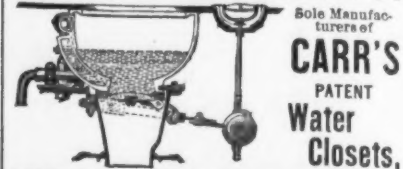
We call your attention specially to our new patent end-less wire frame comb. The result of a long series of experiments, made with a view to meeting all the requirements of a Perfect Comb, it is better, stronger, and more durable than any ever before invented. The raised wire shank gives what has never before been attained, viz: a rest and brace for the thumb, in such a position that the hand cannot come in contact with the horse while using the comb. The wire braces which run from the shank over the back to the front teeth give strength and durability in a direction never heretofore attained, and at the same time serve as an extra handle; and when clasped by the fingers in connection with the raised shank the comb is more firmly held, and completely held, and with much less fatigue to the hand than is possible in any other formation—is short, it needs but a trial to vindicate its name: The Perfect Comb.

THE LAWRENCE COMB CO.

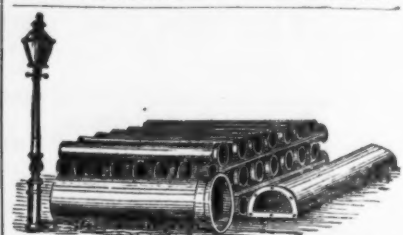
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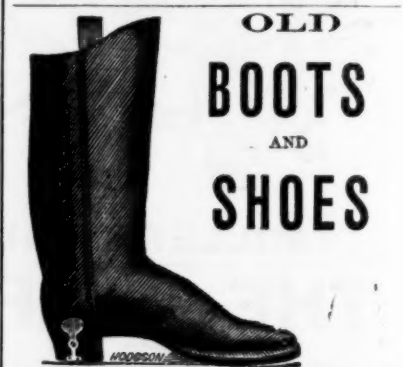


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Metallic
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COAL WASHING MACHINES AND
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No. 1, 10x14 in. face, 4 in. jaw Vise, weight 40 lbs. \$4.50
No. 2, 8x14 in. face, 3 1/2 in. " " 35 " 3.75
No. 3, 6x14 in. " " 28 " " 24 " 3.00
The face of the Anvil is chill hardened. Terms cash.
Delivered on cars at Worcester.
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Liberal discount to the trade.



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Chattillon John & Sons, N. Cliff, N. Y., 9
Hart Bros., 22 above Master, 9
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Scrops.
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Spencer, Jos. W., 121 Walnut, Philadelphia, 17

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Moss F., 30 John, N. Y., 32
Wiley Machinery Co., Kalamazoo, Mass., 3
Van Wart, Son & Co., 134 & 138 Duane, N. Y., 11

Steel Castings, Manufacturers of.
Albany Steam Trap Co., Albany, N. Y., 38
Chester Castings Co., Evelina, Phila. Pa., 40
Cleveland Cast Steel Works, Cleveland, O., 40
Cleveland Steel Co., Buffalo, N. Y., 40
Flag Stanley G. & Co., 215 & 218 N. 3rd, Phila., 40
Pittsburgh Steel Casting Co., Pittsburgh, Pa., 40

Steel Castings, Manufacturers of.
Carly & Riley, 82 John, N. Y., 3
Francis S. & Co., 6 Cliff, N. Y., 3
Jonas, Meyer & Colver, Hartford, Conn., 32
Moss F., 30 John, N. Y., 32
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Steel Castings, Manufacturers of.
Carly & Riley, 82 John, N. Y., 3
Francis S. & Co., 6 Cliff, N. Y.,

To the Hardware Trade
A General assortment of
HARDWARE
For the country trade constantly on hand.
JOHN L. BROWER & SON, 288 Greenwich Street, New York.
JOWETT'S HORSE RASPS, 14, 15 and 16 IN.
Agents for Maharaj's No. 1 Tire Shrinker, Muller's Rasps, Clark's New Pat. Sash Estimator, and 1 for Clow's

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10 8 6 4 3 2 1 1/2 1 OZ.

Swedes Iron, Upholsterers', Gimp & Cut Tacks.

TINNED, LEATHERED AND LARGE HEAD IRON CARPET TACKS.

Trunk, Clout and Finishing Nails, Brads, Patent Brads, &c.

Lining, Saddle and Tufting Nails, Coffin Tacks and Tufting Buttons.

COPPER, ZINC, STEEL, AND SWEDS AND COMMON IRON SHOE NAILS, &c.

Regular and Chisel Pointed Boat Nails of Copper, Iron or Galvanized, Copper, Brass

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Box Nails, 2d & 3d Fine Nails, Roofing Tacks and Nails, &c., &c.

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A full line of goods may be found at the

NEW YORK SALESDROOM, No. 117 Chambers Street.

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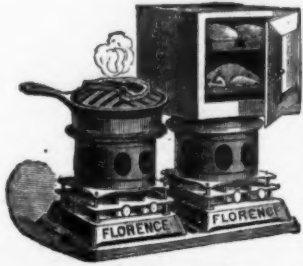


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MADE



Double Cook.

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Manufacturers of

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Wrought Iron Butts, Hinges

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DOOR BOLTS,

Plain, Japanned, Bronzed and Plated.

We have recently purchased CROOKE & CO.'S entire stock of WROUGHT BRIGHT BUTTS, orders for which are solicited.

FACTORIES: New Britain, Connecticut. WAREHOUSE: 79 Chambers St., New York.

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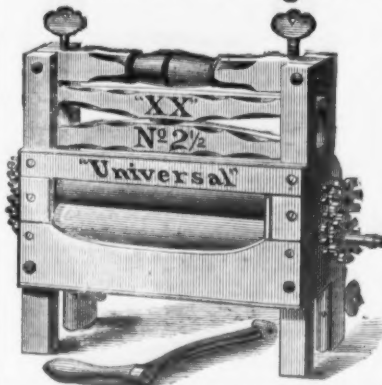
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THE "OLD RELIABLE" UNIVERSAL Clothes Wringer.



Improved with Rowell's Double Cog-Wheels on both ends of each roll.

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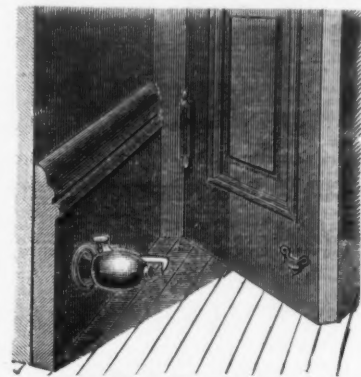
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Be sure and inquire for the "Universal."

Sold by dealers everywhere.

Metropolitan Washing Machine Co.
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DOOR STOP AND HOLDER,

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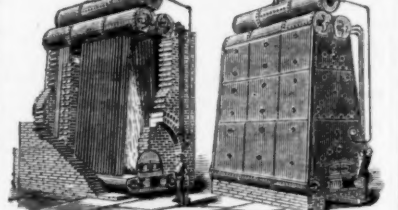
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The Boiler that made the hottest, driest and greatest quantity of Steam at the Centennial Exhibition. Tubes never require cleaning or scraping. Boilers in use for four years without getting dirty.

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We are furnishing outfits specially adapted for Stove Work, giving a pure white deposit on plain or metal surfaces.

Outfits complete, with Dynamo-Electric Machine Tanks, Anodes, Solution, &c., &c., \$2.50. We beg to refer to the following Stove Manufacturers among 500 other houses using the Weston Machine: Richardson & Boynton, S. S. Jewett & Co., Detroit Stove Works, Michigan Stove Co., Co-operative Stove Co., E. & C. Gurney, Hamilton & Loranto, and many others.

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GEORGE W. JACKSON,

Successor to S. S. OWEN & CO.,

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PLEASE NOTICE THAT THE Hubbard, Bakewell & Co. Corrugated Strap Scoop IS BETTER THAN THE PLAIN, FOR REASONS HERE SUGGESTED.



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It is made of

Decarbonized Iron

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a Perfect Enamel

of Unquestionable

Purity.



Its Merits have

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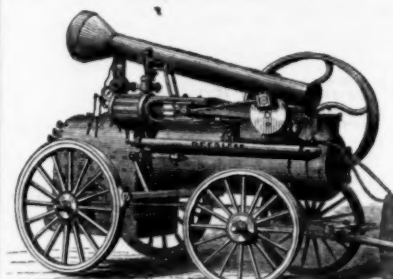
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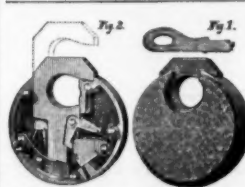
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1876

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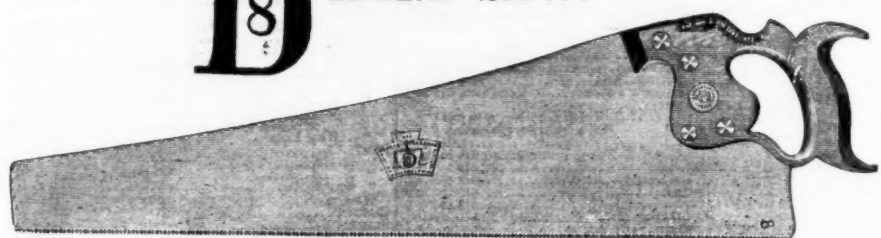
Henry Disston & Sons,

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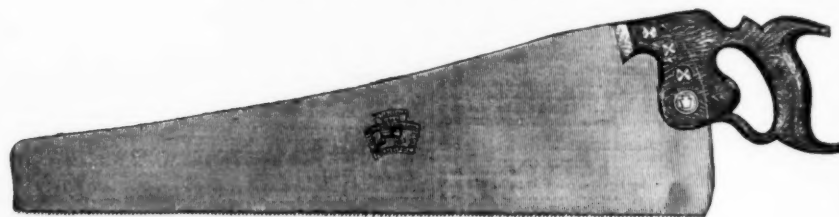
SAWS.



D HAND SAW.



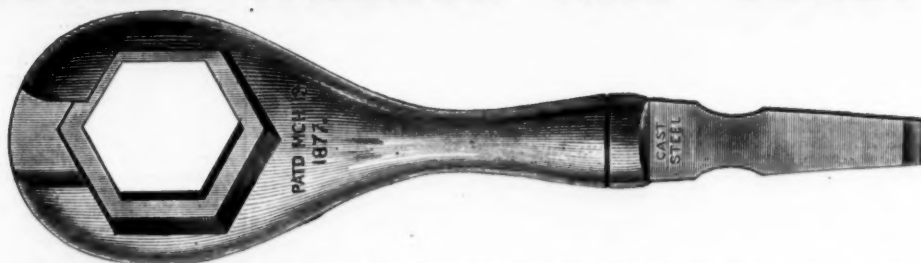
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RIP SAW.



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LIST PRICE.—Three Sizes—No. 1, \$1.10; No. 2, \$1.15; No. 3, \$1.20 per dozen.

The advantage of the Screw Driver alone, over the wooden handled one, is obvious, viz.:

The bit cannot be pulled out, it will not work loose, and the splitting of handles is avoided. The **WRENCH** is made to fit six or more bolt heads or nuts of various sizes.

The **WRENCH** and **SCREW DRIVER**, making two tools in one, for the price of one, is light, strong and handy.

The **WRENCH** and **SCREW DRIVER**, is ESPECIALLY adapted for use on Sewing Machines, and is a most acceptable and very useful attachment. We manufacture several sizes to suit the various makes of Machines in the market.

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HARDWARE.

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Joint Narrow.....	dis	20c10
1/2" Narrow.....	dis	30c10
Loose Joint Broad.....	dis	40c10
Table Ratts, Back Flaps &c.....	dis	30c10
"Sail" Hilds.....	dis	30c10
"Light.....	dis	20c10
Loose Flat, Wrt. Sp.....	dis	20c10
American Spiral Spring Butt Co., Jap'd.....	dis	25
Sabin Mfg. Co.'s Double Acting.....	dis	10
Centennial, Japanned.....	dis	25
"Ornamental.....	dis	20
Union Spring Hinge Co.'s.....	dis	25
American Spring Hinge Co.'s.....	dis	25
Union Mfg. Co.....	dis	25
Blind Ratts, Japanned.....	dis	20
"Palmer.....	dis	20
"Seymour.....	dis	20
"Shapard.....	dis	20
"Lull & Porter.....	dis	20
"Nicholson.....	dis	20
"Huffer.....	dis	20
"Clark's, Nos. 1, 3, 4, 40 and 50.....	dis	20
"Sargent's.....	dis	20
"Butechers.....	dis	20
Humason & Beckley Mfg. Co.....	dis	20
D. R. Barton Tool Co.....	dis	20
Beatty's.....	dis	20
\$10.50 19.00 21.50 24.00 27.00 30.00 33.50 36.50		
\$20.00 26.00 28.50 33.00 37.00 41.00 45.00		
Hart Mfg. Co.....	dis	20
Can Openers.		
A Messenger's Comet.....	dis	20
Lyman's.....	dis	20
Pool.....	dis	20
Union Spring Hinge Co.'s.....	dis	20
No. 4, Iron Handle.....	dis	20
Eureka.....	dis	20
Saine Score.....	dis	20
Star.....	dis	20
Caps—Perfection, 1/2" No.		
Hunt & Goldmar's.....	dis	20
"E. B. 1-10 Ground.....	dis	20
"E. B. 1-10 Turned.....	dis	20
"W. P. 1-10.....	dis	20
"D. W. P. 1/4.....	dis	20
"Coll's 1-10.....	dis	20
Ely's E. B.....	dis	20
"Double Waterproof, 1-1/4, \$1.50; 1-1/8, \$1.50, gold		
Coll's.....	dis	20
"Harris & Perrelli.....	dis	20
Carden—Horse and Curry.....	dis	20
Cotton.....	dis	20
Wool.....	dis	20
Carpet Stretchers.		
Cast Steel, Polished.....	dis	20
Iron Steel Point.....	dis	20
Casters.		
Bed.....	dis	20
Deep Socket.....	dis	20
Cattle Lenders.		
Humason & Beckley Mfg. Co.....	dis	20
Union Mfg. Co.....	dis	20
Chain.		
"No. 1-2..... by the case, \$ pair 45 @ 40c		
"No. 3-4..... by the case, \$ pair 45 @ 40c		
"No. 5-6..... by the case, \$ pair 45 @ 40c		
"No. 7-8..... by the case, \$ pair 45 @ 40c		
"No. 9-10..... by the case, \$ pair 45 @ 40c		
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"No. 21-22..... by the case, \$ pair 45 @ 40c		
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"No. 25-26..... by the case, \$ pair 45 @ 40c		
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Latchet, Mead's	dis 20
" Ingersoll's (old list).....	dis 20
" Whitney's.....	dis 20
" W. L. Moore's.....	dis 20
" Moore's Triple Action.....	dis 20
Whitney's Hand Drill.....	dis 20
W. L. Moore's.....	dis 20
Automatic Borings Tool.....	each \$2.75, 41 3/4	dis 20
Drill Chucks—More's Beach Patent.....	dis 20
Danbury.....	\$8.00, dis 30	
Dr. Henters.		
Ever.....	¥ dos \$3.00, dis 20	
Family.....	¥ dos \$3.00, ne	
National.....	¥ dos \$4.50, dis 33 1/2	
Schmid.....	¥ dos \$3.00, ne	
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Mill E. Buckets, light, 5 to 10 inches, (Duc's Improved)	dis 20
Mill E. Buckets, heavy, 40 to 10 inches (Duc's Improved)	¥ dos \$5.00 to \$10.00, ne	
Emery.		
Genuine Cheater—Regular Nos.....	dis 20
Washington Mills—Regular Nos.....	dis 20
Wellington Mills, Grain.....	dis 20
Hampden Emery Grain.....	dis 20
Enamelled and W.		
Kettles.....	dis 40 to 50	
Sauce Pans.....	dis 30 to 35	
Truss Covers.....	dis 30 to 35	
Eccentric.		
Door Lock.....	Same discounts as Door Lock	
Wood.....	Adjust each \$10.00, dis 20	
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" Penn's.....	dis 40
Fenn's Cold Chisel.....	dis 40
Star.....	dis 40
Wiley's Petroleum.....	dis 40
Wiley and Metallic.....	dis 40
Metallic Key, Leather Lined.....	dis 40
Key Lined.....	dis 40
Emery, Cold Chisel.....	¥ dos \$3.00, dis 20	
Felloe Planes.		
" Files.....	¥ 100, dis 20	
" File Co.....	\$5.00 to 2 currency, dis 20	
Urburn.....	\$5.00 to 2 currency, dis 20	
Arcade.....	\$5.00 to 2 currency, dis 20	
" Star.....	dis 20
Nicholson.....	(Nicholson List) dis 20	
Heller & Bros.....	\$5.00 to 2 currency, dis 20	
W. L. Moore's.....	\$2.00 to 2 currency, dis 20	
Jowitt's.....	\$4.50 to 2 gold	
J. & Kelley Carr.....	4.50 to 2 gold	
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Boydston's Cant.....	dis 40
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Knock, Rich Rollers.....	2.00 each ne	
Peelers, 4-inch Roll.....	4.50 each ne	
Eagle, 3-inch Roll.....	\$30 50 each ne	
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Asphaltum.....	7 gal. 15c
Benzine.....	" " 7 1/2 "
Chalk.....	" " 6 "
Dryer, Patent, Am'n	ass't cans, 10c; keg, 95
" Block.....	100 1/2
Glass, White.....	250
Glasses' Points, Zinc.....	250
Gum, Copal.....	180
" Damar.....	250
" Shellac, English.....	100
" " " dark.....	250
Litharge, English.....	95 gold
Fume Stone, selected Lump.....	33 1/2 44c
" " powdered.....	250
Putty, in bladders.....	250
Printings.....	40
Rotten Stone, soft, English.....	20
Spirits Turpentine.....	33c
Whiting Spanish.....	50c

Glass.

FRENCH WINDOW GLASS.
Prices current per box of 50 feet.
Single Thick.—discount 6 to 7.

sizes.	1st.	2d.	3d.	4th
0 x 8 to 10 x 15.....	\$ 7.50	\$ 6.75	\$ 6.25	\$ 5.75
11 x 14 to 15 x 25.....	8.50	7.75	7.25	6.50
13 x 32 to 20 x 30.....	10.75	9.75	8.75	"
15 x 35 to 20 x 30.....	12.25	10.75	9.00	"
20 x 28 to 24 x 30.....	13.00	11.50	9.75	"
20 x 37 to 28 x 42.....	14.50	13.25	10.75	"
20 x 45 to 30 x 50.....	15.00	14.00	11.25	"
30 x 37 to 32 x 50.....	16.50	14.50	12.00	"
30 x 50 to 34 x 50.....	17.25	15.50	13.50	"
34 x 58 to 34 x 60.....	20.25	17.50	15.00	"
35 x 50 to 42 x 60.....	20.75	18.75	17.25	"

Double Thick.—Discount 6 to 7 1/2.

sizes.	1st.	2d.	3d.	4th
6 x 8 to 10 x 15.....	\$12.00	\$11.00	\$10.00	\$ 9.75
10 x 14 to 15 x 25.....	13.75	12.50	11.75	10.50
18 x 22 to 20 x 30.....	17.25	15.75	14.00	"
15 x 35 to 24 x 30.....	19.75	17.75	14.50	"
20 x 28 to 24 x 30.....	21.00	18.50	14.75	"
20 x 35 to 28 x 42.....	23.25	21.25	17.25	"
20 x 45 to 30 x 50.....	24.00	22.50	18.00	"
30 x 37 to 32 x 50.....	25.75	23.25	19.25	"
30 x 50 to 34 x 50.....	27.75	25.00	21.75	"
34 x 58 to 34 x 60.....	29.75	27.75	24.00	"
35 x 50 to 42 x 60.....	31.25	30.00	27.75	"

Sizes above 40 x 50—\$10.00 per box extra for every five inches.

An additional 10 per cent. will be charged for all glass more than 40 inches wide. All sizes above 42 inches in length, and not making more than 8 united inches, will be charged in the 8 united inches size.

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AMERICAN

CHISELS,

JAPANESE,
\$3.00 per doz.

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CREAM FREEZER.

FOUR STYLES—15 SIZES.

GEARED FREEZERS.

No. 20..... 3 quart.	No. 24..... 10 quart.
No. 21..... 4 " "	No. 25..... 12 " "
No. 22..... 6 " "	No. 26..... 16 " "
No. 23..... 8 " "	No. 27..... 20 " "

FLY WHEEL FREEZERS.

No. 28..... 16 quart.	No. 30..... 32 quart.
No. 29..... 20 " "	No. 31..... 40 " "

FRAME FREEZERS.

No. 33..... 32 quart.	No. 34..... 40 " "
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DUPLEX FREEZERS.

No. 32..... Two 20 quart.

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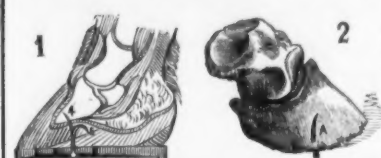
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No. 4 represents one of these nails which was driven into the hoof, and sheared in driving, one thin blade passing into the quick or sensitive sole. No. 5 the thick blade of the nail passed out of the wall of the hoof for clinching. After a few days the horse was returned lame, and upon the removal of the shoe, a nail similar to the above was found to have penetrated through the coffin bone, as seen in Fig. 2, letter A.

The foot is the most important member of the animal's body, to which the greatest care and attention should be directed; for when it becomes injured or diseased, no matter how perfect or sound the other parts may be, the horse's services are diminished or altogether lost. Hence the value of a horse depends upon the condition of his feet. "NO FOOT NO HORSE."

As the remedy lies with the owner of the horse, it is for him to prohibit any cold-cut or sheared nails being used in his horse's feet. The only Hot-Drawn and Hammer-Pointed Horse Shoe Nail in the World that is not cut or clipped, sheared upon the point, and will not split in driving, is the PUTNAM NAIL. See that your horse is shod with this nail and avoid all risks. For sale by all dealers in Horse nails.



The above drawing was made from a nail, showing the lamination of iron in the Cold-Cut and Shearing process.

This drawing was made from the nail taken from the hoof and coffin bone, as shown in Figs. 1 and 2.

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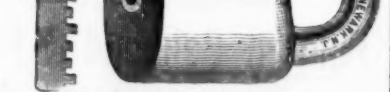
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Merchant Iron.		Flat Bar.	
1 1/2 to 3 1/2 in.	1.80c	1 1/2 to 3 1/2 in.	1.90c
3 1/2 to 5 1/2 in.	2.00c	3 1/2 to 5 1/2 in.	2.10c
5 1/2 to 7 1/2 in.	2.20c	5 1/2 to 7 1/2 in.	2.30c
7 1/2 to 9 1/2 in.	2.40c	7 1/2 to 9 1/2 in.	2.50c
9 1/2 to 11 1/2 in.	2.60c	9 1/2 to 11 1/2 in.	2.70c
11 1/2 to 13 1/2 in.	2.80c	11 1/2 to 13 1/2 in.	2.90c
13 1/2 to 15 1/2 in.	3.00c	13 1/2 to 15 1/2 in.	3.10c
15 1/2 to 17 1/2 in.	3.20c	15 1/2 to 17 1/2 in.	3.30c
17 1/2 to 19 1/2 in.	3.40c	17 1/2 to 19 1/2 in.	3.50c
19 1/2 to 21 1/2 in.	3.60c	19 1/2 to 21 1/2 in.	3.70c
21 1/2 to 23 1/2 in.	3.80c	21 1/2 to 23 1/2 in.	3.90c
23 1/2 to 25 1/2 in.	4.00c	23 1/2 to 25 1/2 in.	4.10c
25 1/2 to 27 1/2 in.	4.20c	25 1/2 to 27 1/2 in.	4.30c
27 1/2 to 29 1/2 in.	4.40c	27 1/2 to 29 1/2 in.	4.50c
29 1/2 to 31 1/2 in.	4.60c	29 1/2 to 31 1/2 in.	4.70c
31 1/2 to 33 1/2 in.	4.80c	31 1/2 to 33 1/2 in.	4.90c
33 1/2 to 35 1/2 in.	5.00c	33 1/2 to 35 1/2 in.	5.10c
35 1/2 to 37 1/2 in.	5.20c	35 1/2 to 37 1/2 in.	5.30c
37 1/2 to 39 1/2 in.	5.40c	37 1/2 to 39 1/2 in.	5.50c
39 1/2 to 41 1/2 in.	5.60c	39 1/2 to 41 1/2 in.	5.70c
41 1/2 to 43 1/2 in.	5.80c	41 1/2 to 43 1/2 in.	5.90c
43 1/2 to 45 1/2 in.	6.00c	43 1/2 to 45 1/2 in.	6.10c
45 1/2 to 47 1/2 in.	6.20c	45 1/2 to 47 1/2 in.	6.30c
47 1/2 to 49 1/2 in.	6.40c	47 1/2 to 49 1/2 in.	6.50c
49 1/2 to 51 1/2 in.	6.60c	49 1/2 to 51 1/2 in.	6.70c
51 1/2 to 53 1/2 in.	6.80c	51 1/2 to 53 1/2 in.	6.90c
53 1/2 to 55 1/2 in.	7.00c	53 1/2 to 55 1/2 in.	7.10c
55 1/2 to 57 1/2 in.	7.20c	55 1/2 to 57 1/2 in.	7.30c
57 1/2 to 59 1/2 in.	7.40c	57 1/2 to 59 1/2 in.	7.50c
59 1/2 to 61 1/2 in.	7.60c	59 1/2 to 61 1/2 in.	7.70c
61 1/2 to 63 1/2 in.	7.80c	61 1/2 to 63 1/2 in.	7.90c
63 1/2 to 65 1/2 in.	8.00c	63 1/2 to 65 1/2 in.	8.10c
65 1/2 to 67 1/2 in.	8.20c	65 1/2 to 67 1/2 in.	8.30c
67 1/2 to 69 1/2 in.	8.40c	67 1/2 to 69 1/2 in.	8.50c
69 1/2 to 71 1/2 in.	8.60c	69 1/2 to 71 1/2 in.	8.70c
71 1/2 to 73 1/2 in.	8.80c	71 1/2 to 73 1/2 in.	8.90c
73 1/2 to 75 1/2 in.	9.00c	73 1/2 to 75 1/2 in.	9.10c
75 1/2 to 77 1/2 in.	9.20c	75 1/2 to 77 1/2 in.	9.30c
77 1/2 to 79 1/2 in.	9.40c	77 1/2 to 79 1/2 in.	9.50c
79 1/2 to 81 1/2 in.	9.60c	79 1/2 to 81 1/2 in.	9.70c
81 1/2 to 83 1/2 in.	9.80c	81 1/2 to 83 1/2 in.	9.90c
83 1/2 to 85 1/2 in.	10.00c	83 1/2 to 85 1/2 in.	10.10c
85 1/2 to 87 1/2 in.	10.20c	85 1/2 to 87 1/2 in.	10.30c
87 1/2 to 89 1/2 in.	10.40c	87 1/2 to 89 1/2 in.	10.50c
89 1/2 to 91 1/2 in.	10.60c	89 1/2 to 91 1/2 in.	10.70c
91 1/2 to 93 1/2 in.	10.80c	91 1/2 to 93 1/2 in.	10.90c
93 1/2 to 95 1/2 in.	11.00c	93 1/2 to 95 1/2 in.	11.10c
95 1/2 to 97 1/2 in.	11.20c	95 1/2 to 97 1/2 in.	11.30c
97 1/2 to 99 1/2 in.	11.40c	97 1/2 to 99 1/2 in.	11.50c
99 1/2 to 101 1/2 in.	11.60c	99 1/2 to 101 1/2 in.	11.70c
101 1/2 to 103 1/2 in.	11.80c	101 1/2 to 103 1/2 in.	11.90c
103 1/2 to 105 1/2 in.	12.00c	103 1/2 to 105 1/2 in.	12.10c
105 1/2 to 107 1/2 in.	12.20c	105 1/2 to 107 1/2 in.	12.30c
107 1/2 to 109 1/2 in.	12.40c	107 1/2 to 109 1/2 in.	12.50c
109 1/2 to 111 1/2 in.	12.60c	109 1/2 to 111 1/2 in.	12.70c
111 1/2 to 113 1/2 in.	12.80c	111 1/2 to 113 1/2 in.	12.90c
113 1/2 to 115 1/2 in.	13.00c	113 1/2 to 115 1/2 in.	13.10c
115 1/2 to 117 1/2 in.	13.20c	115 1/2 to 117 1/2 in.	13.30c
117 1/2 to 119 1/2 in.	13.40c	117 1/2 to 119 1/2 in.	13.50c
119 1/2 to 121 1/2 in.	13.60c	119 1/2 to 121 1/2 in.	13.70c
121 1/2 to 123 1/2 in.	13.80c	121 1/2 to 123 1/2 in.	13.90c
123 1/2 to 125 1/2 in.	14.00c	123 1/2 to 125 1/2 in.	14.10c
125 1/2 to 127 1/2 in.	14.20c	125 1/2 to 127 1/2 in.	14.30c
127 1/2 to 129 1/2 in.	14.40c	127 1/2 to 129 1/2 in.	14.50c
129 1/2 to 131 1/2 in.	14.60c	129 1/2 to 131 1/2 in.	14.70c
131 1/2 to 133 1/2 in.	14.80c	131 1/2 to 133 1/2 in.	14.90c
133 1/2 to 135 1/2 in.	15.00c	133 1/2 to 135 1/2 in.	15.10c
135 1/2 to 137 1/2 in.	15.20c	135 1/2 to 137 1/2 in.	15.30c
137 1/2 to 139 1/2 in.	15.40c	137 1/2 to 139 1/2 in.	15.50c
139 1/2 to 141 1/2 in.	15.60c	139 1/2 to 141 1/2 in.	15.70c
141 1/2 to 143 1/2 in.	15.80c	141 1/2 to 143 1/2 in.	15.90c
143 1/2 to 145 1/2 in.	16.00c	143 1/2 to 145 1/2 in.	16.10c
145 1/2 to 147 1/2 in.	16.20c	145 1/2 to 147 1/2 in.	16.30c
147 1/2 to 149 1/2 in.	16.40c	147 1/2 to 149 1/2 in.	16.50c
149 1/2 to 151 1/2 in.	16.60c	149 1/2 to 151 1/2 in.	16.70c
151 1/2 to 153 1/2 in.	16.80c	151 1/2 to 153 1/2 in.	16.90c
153 1/2 to 155 1/2 in.	17.00c	153 1/2 to 155 1/2 in.	17.10c
155 1/2 to 157 1/2 in.	17.20c	155 1/2 to 157 1/2 in.	17.30c
157 1/2 to 159 1/2 in.	17.40c	157 1/2 to 159 1/2 in.	17.50c
159 1/2 to 161 1/2 in.	17.60c	159 1/2 to 161 1/2 in.	17.70c
161 1/2 to 163 1/2 in.	17.80c	161 1/2 to 163 1/2 in.	17.90c
163 1/2 to 165 1/2 in.	18.00c	163 1/2 to 165 1/2 in.	18.10c
165 1/2 to 167 1/2 in.	18.20c	165 1/2 to 167 1/2 in.	18.30c
167 1/2 to 169 1/2 in.	18.40c	167 1/2 to 169 1/2 in.	18.50c
169 1/2 to 171 1/2 in.	18.60c	169 1/2 to 171 1/2 in.	18.70c
171 1/2 to 173 1/2 in.	18.80c	171 1/2 to 173 1/2 in.	18.90c
173 1/2 to 175 1/2 in.	19.00c	173 1/2 to 175 1/2 in.	19.10c
175 1/2 to 177 1/2 in.	19.20c	175 1/2 to 177 1/2 in.	19.30c
177 1/2 to 179 1/2 in.	19.40c	177 1/2 to 179 1/2 in.	19.50c
179 1/2 to 181 1/2 in.	19.60c	179 1/2 to 181 1/2 in.	19.70c
181 1/2 to 183 1/2 in.	19.80c	181 1/2 to 183 1/2 in.	19.90c
183 1/2 to 185 1/2 in.	20.00c	183 1/2 to 185 1/2 in.	20.10c
185 1/2 to 187 1/2 in.	20.20c	185 1/2 to 187 1/2 in.	20.30c
187 1/2 to 189 1/2 in.	20.40c	187 1/2 to 189 1/2 in.	20.50c
189 1/2 to 191 1/2 in.	20.60c	189 1/2 to 191 1/2 in.	20.70c
191 1/2 to 193 1/2 in.	20.80c	191 1/2 to 193 1/2 in.	20.90c
193 1/2 to 195 1/2 in.	21.00c	193 1/2 to 195 1/2 in.	21.10c
195 1/2 to 197 1/2 in.	21.20c	195 1/2 to 197 1/2 in.	21.30c
197 1/2 to 199 1/2 in.	21.40c	197 1/2 to 199 1/2 in.	21.50c
199 1/2 to 201 1/2 in.	21.60c	199 1/2 to 201 1/2 in.	21.70c
201 1/2 to 203 1/2 in.	21.80c	201 1/2 to 203 1/2 in.	21.90c
203 1/2 to 205 1/2 in.	22.00c	203 1/2 to 205 1/2 in.	22.10c
205 1/2 to 207 1/2 in.	22.20c	205 1/2 to 207 1/2 in.	22.30c
207 1/2 to 209 1/2 in.	22.40c	207 1/2 to 209 1/2 in.	22.50c
209 1/2 to 211 1/2 in.	22.60c	209 1/2 to 211 1/2 in.	22.70c
211 1/2 to 213 1/2 in.	22.80c	211 1/2 to 213 1/2 in.	22.90c
213 1/2 to 215 1/2 in.	23.00c	213 1/2 to 215 1/2 in.	23.10c
215 1/2 to 217 1/2 in.	23.20c	215 1/2 to 217 1/2 in.	23.30c
217 1/2 to 219 1/2 in.	23.40c	217 1/2 to 219 1/2 in.	23.50c
219 1/2 to 221 1/2 in.	23.60c	219 1/2 to 221 1/2 in.	23.70c
221 1/2 to 223 1/2 in.	23.80c	221 1/2 to 223 1/2 in.	23.90c
223 1/2 to 225 1/2 in.	24.00c	223 1/2 to 225 1/2 in.	24.10c
225 1/2 to 227 1/2 in.	24.20c	225 1/2 to 227 1/2 in.	24.30c
227 1/2 to 229 1/2 in.	24.40c	227 1/2 to 229 1/2 in.	24.50c
229 1/2 to 231 1/2 in.	24.60c	229 1/2 to 231 1/2 in.	24.70c
231 1/2 to 233 1/2 in.	24.80c	231 1/2 to 233 1/2 in.	24.90c
233 1/2 to 235 1/2 in.	25.00c	233 1/2 to 235 1/2 in.	25.10c
235 1/2 to 237 1/2 in.	25.20c	235 1/2 to 237 1/2 in.	25.30c
237 1/2 to 239 1/2 in.	25.40c	237 1/2 to 239 1/2 in.	25.50c
239 1/2 to 241 1/2 in.	25.60c	239 1/2 to 241 1/2 in.	25.70c
241 1/2 to 243 1/2 in.	25.80c	241 1/2 to 243 1/2 in.	25.90c
243 1/2 to 245 1/2 in.	26.00c	243 1/2 to 245 1/2 in.	26.10c
245 1/2 to 247 1/2 in.	26.20c	245 1/2 to 247 1/2 in.	26.30c
247 1/2 to 249 1/2 in.	26.40c	247 1/2 to 249 1/2 in.	26.50c
249 1/2 to 251 1/2 in.	26.60c	249 1/2 to 251 1/2 in.	26.70c
251 1/2 to 253 1/2 in.	26.80c	251 1/2 to 253 1/2 in.	26.90c
253 1/2 to 255 1/2 in.	27.00c	253 1/2 to 255 1/2 in.	27.10c
255 1/2 to 257 1/2 in.	27.20c	255 1/2 to 257 1/2 in.	27.30c
257 1/2 to 259 1/2 in.	27.40c	257 1/2 to 259 1/2 in.	27.50c
259 1/2 to 261 1/2 in.	27.60c	259 1/2 to 261 1/2 in.	27.70c
261 1/2 to 263 1/2 in.	27.80c	261 1/2 to 263 1/2 in.	27.90c
263 1/2 to 265 1/2 in.	28.00c	263 1/2 to 265 1/2 in.	28.10c
265 1/2 to 267 1/2 in.	28.20c	265 1/2 to 267 1/2 in.	28.30c
267 1/2 to 269 1/2 in.	28.40c	267 1/2 to 269 1/2 in.	28.50c
269 1/2 to 271 1/2 in.	28.60c	269 1/2 to 271 1/2 in.	28.70c
271 1/2 to 273 1/2 in.	28.80c	271 1/2 to 273 1/2 in.	28.90c
273 1/2 to 275 1/2 in.	29.00c	273 1/2 to 275 1/2 in.	29.10c
275 1/2 to 277 1/2 in.	29.20c	275 1/2 to 277 1/2 in.	29.30c
277 1/2 to 279 1/2 in.	29.40c	277 1/2 to 279 1/2 in.	29.50c
279 1/2 to 281 1/2 in.	29.60c	279 1/2 to 281 1/2 in.	29.70c
281 1/2 to 283 1/2 in.	29.80c	281 1/2 to 283 1/2 in.	29.90c
283 1/2 to 285 1/2 in.	30.00c	283 1/2 to 285 1/2 in.	30.10c
285 1/2 to 287 1/2 in.	30.20c	285 1/2 to 287 1/2 in.	30.30c
287 1/2 to 289 1/2 in.	30.40c	287 1/2 to 289 1/2 in.	30.50c
289 1/2 to 291 1/2 in.	30.60c	289 1/2 to 291 1/2 in.	30.70c
291 1/2 to 293 1/2 in.	30.80c	291 1/2 to 293 1/2 in.	30.90c
293 1/2 to 295 1/2 in.	31.00c	293 1/2 to 295 1/2 in.	31.10c
295 1/2 to 297 1/2 in.	31.20c	295 1/2 to 297 1/2 in.	31.30c
297 1/2 to 299 1/2 in.	31.40c	297 1/2 to 299 1/2 in.	31.50c
299 1/2 to 301 1/2 in.	31.60c	299 1/2 to 301 1/2 in.	31.70c
301 1/2 to 303 1/2 in.	31.80c	301 1/2 to 303 1/2 in.	31.90c
303 1/2 to 305 1/2 in.	32.00c	303 1/2 to 305 1/2 in.	32.10c
305 1/2 to 307 1/2 in.	32.20c	305 1/2 to 307 1/2 in.	32.30c
307 1/2 to 309 1/2 in.	32.40c	307 1/2 to 309 1/2 in.	32.50c
309 1/2 to 311 1/2 in.	32.60c	309 1/2 to 311 1/2 in.	32.70c
311 1/2 to 313 1/2 in.	32.80c	311 1/2 to 313 1/2 in.	32.90c
313 1/2 to 315 1/2 in.	33.00c	313 1/2 to 315 1/2 in.	33.10c
315 1/2 to 317 1/2 in.	33.20c	315 1/2 to 317 1/2 in.	33.30c
317 1/2 to 319 1/2 in.	33.40c	317 1/2 to 319 1/2 in.	33.50c
319 1/2 to 321 1/2 in.	33.60c	319 1/2 to 321 1/2 in.	33.70c
321 1/2 to 323 1/2 in.	33.80c	321 1/2 to 323 1/2 in.	33.90c
323 1/2 to 325 1/2 in.	34.00c	323 1/2 to 325 1/2 in.	34.10c
325 1/2 to 327 1/2 in.	34.20c	325 1/2 to 327 1/2 in.	34.30c
327 1/2 to 329 1/2 in.	34.40c	327 1/2 to 329 1/2 in.	34.50c
329 1/2 to 331 1/2 in.	34.60c	329 1/2 to 331 1/2 in.	34.70c
331 1/2 to 333 1/2 in.	34.80c	331 1/2 to 333 1/2 in.	34.90c
333 1/2 to 335 1/2 in.	35.00c	333 1/2 to 335 1/2 in.	35.10c
335 1/2 to 337 1/2 in.	35.20c	335 1/2 to 337 1/2 in.	35.30c
337 1/2 to 339 1/2 in.	35.40c	337 1/2 to 339 1/2 in.	35.50c
339 1/2 to 341 1/2 in.	35.60c	339 1/2 to 341 1/2 in.	35.70c
341 1/2 to 343 1/2 in.	35.80c	341 1/2 to 343 1/2 in.	35.90c
343 1/2 to 345 1/2 in.	36.00c	343 1/2 to 345 1/2 in.	36.10c
345 1/2 to 347 1/2 in.	36.20c	345 1/2 to 347 1/2 in.	36.30c
347 1/2 to 349 1/2 in.	36.40c	347 1/2 to 349 1/2 in.	36.50c
349 1/2 to 351 1/2 in.	36.60c	349 1/2 to 351 1/2 in.	36.70c
351 1/2 to 353 1/2 in.	36.80c	351 1/2 to 353 1/2 in.	36.90c
353 1/2 to 355 1/2 in.	37.00c	353 1/2 to 355 1/2 in.	37.10c
355 1/2 to 357 1/2 in.	37.20c	355 1/2 to 357 1/2 in.	37.30c
357 1/2 to 359 1/2 in.	37.40c	357 1/2 to 359 1/2 in.	37.50c
359 1/2 to 361 1/2 in.	37.60c	359 1/2 to 361 1/2 in.	37.70c
361 1/2 to 363 1/2 in.	37.80c	361 1/2 to 363 1/2 in.	



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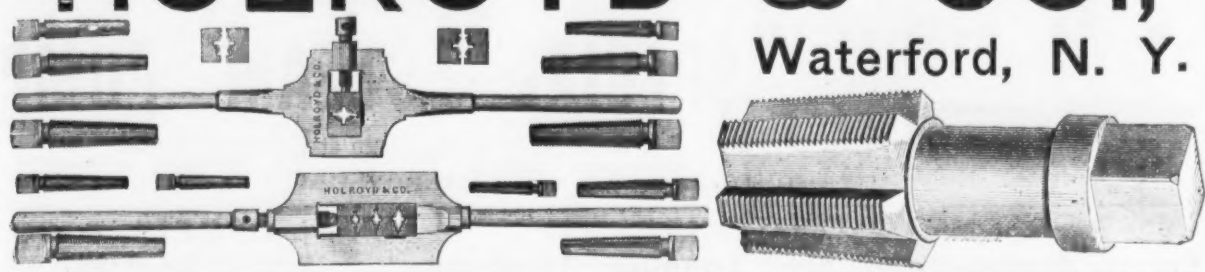
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2 1/2	20.00	22.00	2.25
3	23.00	25.00	2.50
3 1/2	26.00	28.00	2.75
4	31.00	33.00	3.00
4 1/2	36.00	38.00	3.25
5	40.00	42.00	3.50	....
5 1/2	45.00	47.00	3.75	....
6	50.00	52.00	4.00	....
6 1/2	55.00	57.00	4.25	....
7	60.00	62.00	4.50	....
7 1/2	65.00	67.00	4.75	....
8	70.00	72.00	5.00	....
8 1/2	75.00	77.00	5.25	....
9	80.00	82.00	5.50	....
9 1/2	85.00	87.00	5.75	....
10	90.00	92.00	6.00	....
10 1/2	95.00	97.00	6.25	....
11	100.00	102.00	6.50	....
11 1/2	105.00	107.00	6.75	....
12	110.00	112.00	7.00	....
12 1/2	115.00	117.00	7.25	....
13	120.00	122.00	7.50	....
13 1/2	125.00	127.00	7.75	....
14	130.00	132.00	8.00	....
14 1/2	135.00	137.00	8.25	....
15	140.00	142.00	8.50	....
15 1/2	145.00	147.00	8.75	....
16	150.00	152.00	9.00	....
16 1/2	155.00	157.00	9.25	....
17	160.00	162.00	9.50	....
17 1/2	165.00	167.00	9.75	....
18	170.00	172.00	10.00	....
18 1/2	175.00	177.00	10.25	....
19	180.00	182.00	10.50	....
19 1/2	185.00	187.00	10.75	....
20	190.00	192.00	11.00	....
20 1/2	195.00	197.00	11.25
21	200.00	202.00	11.50
21 1/2	205.00	207.00	11.75
22	210.00	212.00	12.00

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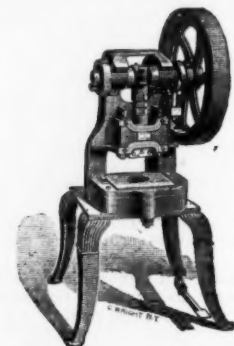
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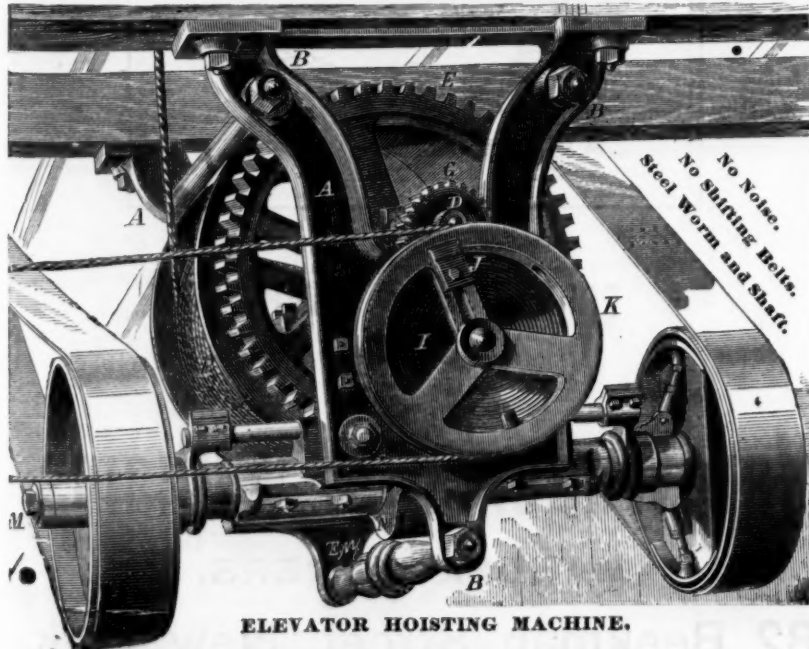
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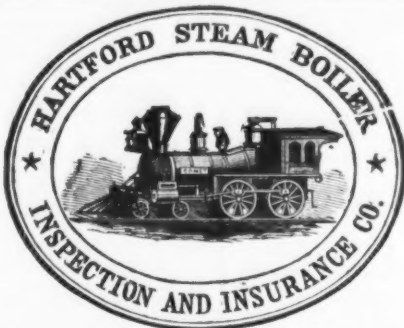
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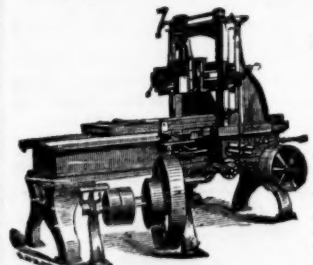
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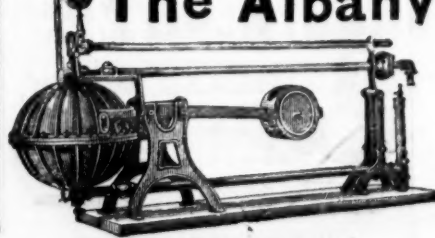
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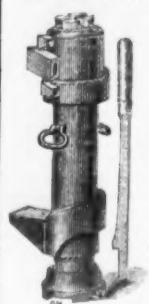
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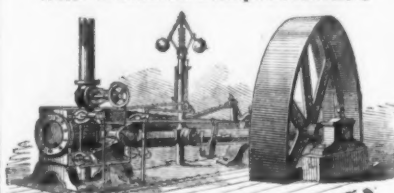
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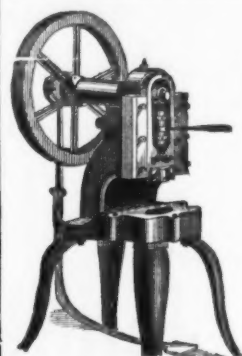
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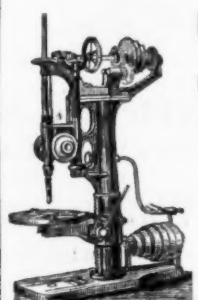


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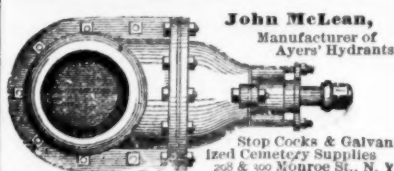
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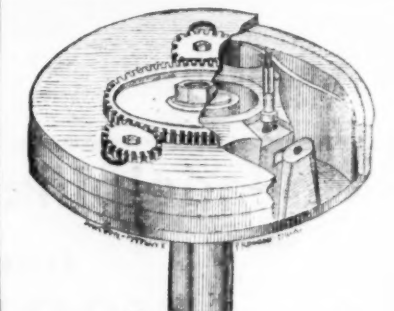


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See cut of Elevator Hoisting Machine in issue of May 16, 1878, page 39.
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TRIAL OF THE IMPROVED LIGHTNING SAW.

The Emperor, Dom Pedro, accompanied by Director General Goshorn, Superintendent Albert, and others, visited Machinery Hall, at the Centennial on the evening of June 28th. Among other things inspected, at the invitation of E. M. Boynton, of New York, they witnessed a trial of the *New Lightning Saw*, patented March 26, 1876. Two men, with one of these saws, cut off a sound log of gum-wood, one foot extreme diameter, in seven seconds, or at the rate of a cord of wood in five minutes. Messrs. Corliss, Morell, Lynch, and other members of the commission, witnessed the trials and timed the cutting. The Emperor remarked, That was fast, very fast cutting. Last evening the Emperor made another examination of the saw.—*Philadelphia Press*, June 30.

"BOYNTON'S SAWS were effectually tested before the judges at the Philadelphia Fair, July 6th and 7th. An ash log, eleven inches in diameter, was sawed off, with a four-and-a-half-foot lightning cross-cut, by two men, in precisely six seconds as timed by the chairman of the Centennial Judges of Class Fifteen. The speed is unprecedented, and would cut a cord of wood in four minutes. The representatives of Russia, Austria, France, Italy, Spain, Belgium, Sweden, England, and several other countries, were present, and expressed their high appreciation."

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